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NEW TYPES OF FIRE BOATS.

The successful test of two Dreadnaught fireboats, the largest in the world, at New York City, May 26, fully demonstrated the practicability of turbine driven centrifugal pumps in fire fighting apparatus. These new boats, the James Duane and the Thomas Willett, are the first of their kind to be equipped with the new centrifugal pumps driven direct by steam turbines and the official trial was so successful and so far in advance of the guarantees of the builders that Chief Edward F. Croker predicted that the centrifugal pump would not only take the place of the old piston pump on fire boats but on fire engines as well.

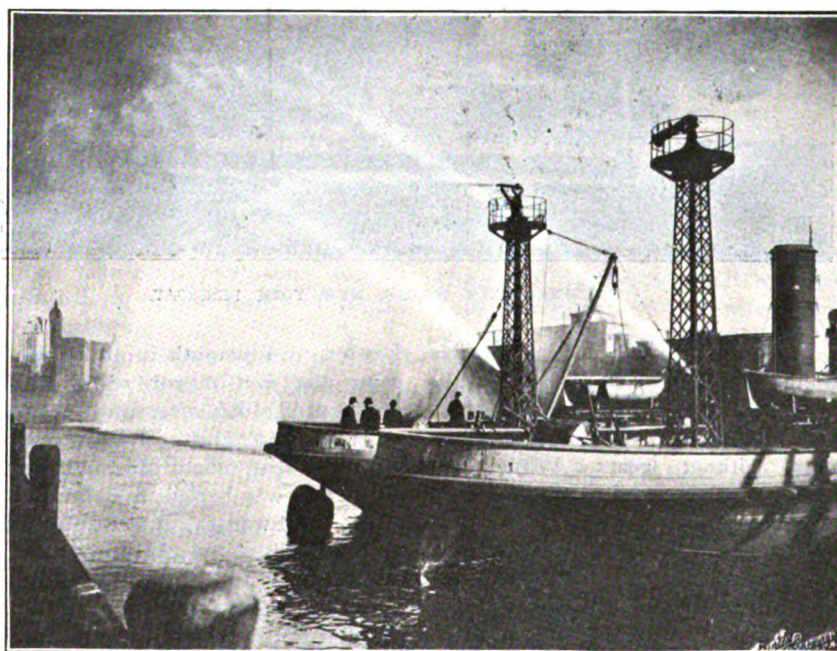
The new boats were built by Alexander Miller & Bros., of Jersey City, N. J., and this firm also installed all the machinery. They are each 131 ft. long on deck and 123 ft. at the water line. The breadth of hull is 27 ft. and the depth 14 ft. The engines are direct acting, compound engines of 850 H. P. Each boat is equipped with a high steel water tower aft upon which is mounted a large 3-in. adjustable nozzle. Another and a similar nozzle is mounted above the pilot house forward and on the two deck turrets. The boats are designed to give plenty of deck room and space for the firemen to work as the only projections are the pilot house forward, the tower aft and the two turrets for hose connections. The details of the construction are worked out nicely and the sister boats are the finest fire fighting crafts afloat. The turbines and centrifugal pumps take up very little floor space in the engine room.

The trial trip of these boats included running, maneuvering, and operating demonstrations under the super-

vision of Chief Edward F. Croker and "Admiral" John Kenlon of the New York fire boat fleet, as well as representatives from the various builders.

During the trial run about the water front the boats developed a speed of over 15 miles per hour. Then the steam was turned on the turbines and the boats began to show what

000 gallons of water per minute while moving ahead at full speed. The streams were gradually turned until only one nozzle was open and the pumps were connected in series. With the enormous pressure of 315 lbs. at the pumps and 230 lbs. at the nozzle, a stream of water was thrown fully 400 ft. in the wind and to a height of



NEW YORK FIREBOATS JAMES DUANE AND THOMAS WILLETT.

they could do in the way of throwing water. The first three 3-in. nozzles on the Willett were opened at 175 lbs. pressure at the pumps, the dial showing a nozzle pressure of 115 lbs., and each nozzle was throwing 3,200 gallons of water, or a total of 9,600 lbs. per minute. When all five of the big nozzles were opened, including those from the tower and the pilot house, the boat was throwing over 12,-

nearly 300 ft. Over 4,550 gallons of water a minute were leaving the nozzle under this enormous pressure. At a later trial this stream of water reached nearly 500 ft.

The two Worthington pumps are 12-in., two-stage centrifugals, direct-connected to Curtis turbine engines. The pumps are each designed for 4,500 gallons a minute against a boiler pressure of 150 lbs., and, while only 9,000

gallons were guaranteed by the builders, more than 12,000 gallons were actually thrown and the boat could in emergency have thrown as high as 14,000 gallons. The sister ship, the James Duane, did equally as well.

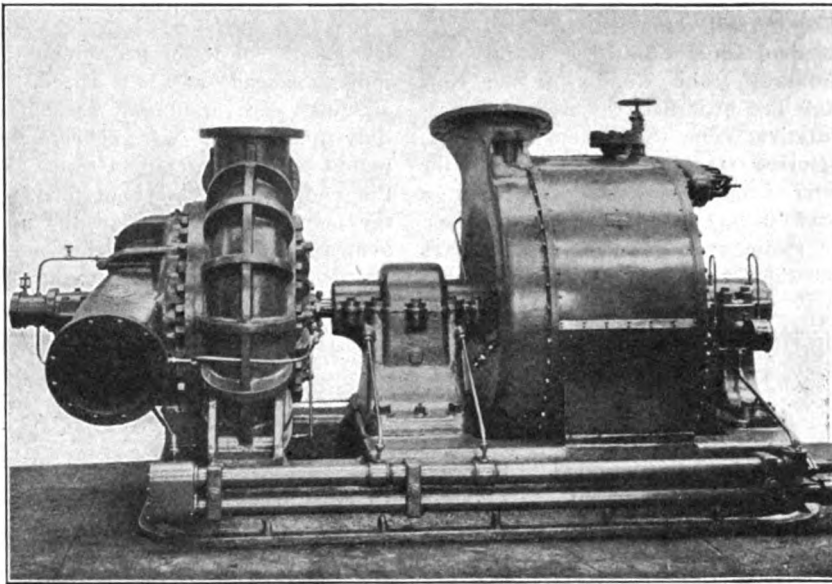
The Curtis turbine engines, built by the General Electric Co., which are direct connected to the centrifugal pumps, are rated at 660 H. P., but are capable of enough overload capacity to deliver 1,000 H. P. continuously. They operate a boiler pressure of 200 lbs. and a vacuum of 26 in. at a speed of 1,800 R. P. M. The rotating parts of the horizontal turbines are direct

ships and the 18-in. searchlights mounted forward on the pilot house.

Every bit of equipment, from the compass to the engines, was tried out on both the new boats under the direction of Chief Croker. Not only did everything work perfectly but the results were far better than the builders anticipated.

The boats were appropriately named after the first two mayors of the city, Thomas Willett and James Duane. Thomas Willett was son of the Rev. Andrew Willett, rector of Barley. He was born on Aug. 29, 1605, at Barley, Hertfordshire, Eng., and came from

with the islands, on to the Sound up to Sands Point; all the Brooklyn water front, through Gravesend Bay, along Coney Island and Rockaway Beach to Broad Channel, and comprises the whole circuit of Staten Island (borough of Richmond) and the islands in the bay, through the Kill von Kull to Shooters Bay. Any ship in the harbor, inside or outside of the Narrows, is entitled to claim the help of a fireboat, when the emergency arises. The value of property that has to be protected runs up into the billions of dollars and calls for constant watchfulness on the part of Chief Kenlon, whose launch *Velox* is a familiar sight in the harbor. The first fireboat in use in New York harbor was the *William F. Havemeyer*. She was built in 1874 and did duty till about three years ago, when she was sold and is now utilized as a tugboat in and round the harbor. She was equipped with two sets of pumps—equal to four first-class fire engines—and could throw four separate streams or one concentrated heavy stream. The *Ziphar Mills* was the next. She was built in 1882 and was called after the veteran fireman of that name—one of the well-known citizens who was a member of the original volunteer fire department of New York.



TURBINE-DRIVEN PUMPS, NEW YORK FIRE BOAT.

connected by means of a flexible coupling to the rotating parts of the centrifugal pumps, the high speed of the turbine being sufficient to run the pumps without gears. While this method is an innovation the trial run fully demonstrated that it is far superior to the old way of pumping water with reciprocating engines geared to piston pumps. Under these conditions each turbine was tested at the rated horsepower before leaving the General Electric Co. and found to deliver 1 H. P. at the shaft for every 15 lbs. of steam. The requirements called for 9,000 gallons of water a minute against 150 lbs. pressure with a steam consumption not to exceed 10,000 lbs. of steam an hour. At the actual test it was demonstrated that this amount of water could be delivered with 9,000 lbs. of steam per hour.

The Thomas Willett and James Duane are also equipped with a 10-K. W. General Electric marine set which furnishes electricity for the numerous lights necessary about the

Leyden to Plymouth in 1632. He became the first mayor of New York on June 12, 1665, after the Dutch gave up to the English. He served two terms in that office; died on Aug. 4, 1674; and was buried in Bullocks Cove cemetery, Swansea, R. I. The grave stone is still there, 233 years after his death.

James Duane was born in New York City on Feb. 6, 1733. He was the son of Anthony Duane. He was state senator in 1783, and was made mayor of New York on Feb. 7, 1784, being the first mayor after the revolution.

The amount of territory protected by the New York fireboats, including all the indentations and windings of the various creeks, rivers, canals, and the space occupied by ferries, wharves, piers, and the like, is close upon, if it does not exceed, 600 miles. It extends from the lightship at Atlantic Highlands to Rockaway Point buoy and to Mount St. Vincent, taking in both sides of the Hudson. It embraces the Harlem and East rivers,

SUMMER TOURS FOR 1908.

The Cleveland & Buffalo Transit Co. have issued their book on "Summer Tours" for 1908. The book first describes the steamers of its fleet, the *City of Buffalo* and the *City of Erie*, incidentally not forgetting to mention that the *City of Erie* is the fastest boat on the lakes. Then follow descriptions of Cleveland, Buffalo and Niagara Falls, as well as the river St. Lawrence and Thousand Islands. The descriptions also of the leading Canadian cities are quite thorough and it is illustrated throughout with excellent photographic reproductions of the leading points of interest in all the cities.

The new excursion steamer *Americana* made her initial trip between Buffalo and Crystal Beach last week. This steamer was built at the yard of the Buffalo Dry Dock Co. for the Lake Erie Excursion Co. T. F. Newman, general manager of the Cleveland & Buffalo line, is manager of the new company. Harry Fisher, general agent of the Cleveland & Buffalo Co., is secretary.

The Lake Erie Dredging Co. has several of its boats at work on the break-water shoal entrance to Buffalo harbor.

BOSTON MARINE NOTES.

Boston, June 10.—The British steamship *Falls of Orchy*, one of the foreign steamers chartered by the navy department to transport coal from Atlantic ports to the Pacific for use of the battleship fleet, arrived at Mystic dock June 1 to unload her cargo of nitrate of soda which she secured at five different ports on the west coast of South America. Part of her cargo was discharged at New York. After discharging her cargo at this port the *Falls of Orchy* sailed for Newport News, Va., where she will load 7,000 tons of coal on a government contract for Auckland, N. Z., for use of the battleship fleet.

The port of Boston shipped a total of 436,118 bbls. of apples to ports in Europe during the season just passed, as against 509,228 bbls. last year and 430,994 barrels the previous year. In the shipment of apples all ports were led by Montreal, New York came second. Portland, Halifax and Sydney followed in order named. From all ports above named a total of 2,491,316 bbls. were shipped the past season, compared with 2,291,193 bbls. last season and 2,186,251 the previous season.

On her maiden trip from Naples and Genoa, the new steamship *Principe Di Udine* of the Lloyd Sabauda, fast Italian mail line, will arrive at this port in the near future. The steamship, which was recently launched at Glasgow, was built at the ship yards of Barclay, Curley & Co. The new boat has a displacement of about 14,000 tons, quadruple expansion engines of the most modern design, and is expected to turn up 20 miles per hour on her trial trip.

The *Principe Di Udine* was named after the young son of the Duke of Genoa, admiral of the Italian navy, and it is rumored that the duke will take passage on this steamer when he comes to this country to attend the wedding of his cousin, the Duke of Abruzzi, to Miss Elkins.

The *Principe Di Udine* has cabin accommodations for 350 first and second class passengers and for 1,200 steerage passengers. A gymnasium has been fitted on the upper promenade deck, a winter garden, a cafe, a children's play room, and the customary saloon and smoking rooms. In a most elaborate manner the dining saloon has been decorated by noted Italian artists. There are no upper berths in any of the first class cabins, and these are located on the promenade deck, including a number of

chambres de luxe, composed of a bed room, sitting room and bath room, all with large windows and elaborately furnished. On this steamer as well as on her sister ship, *Tomaso di Savoia*, on schedule to arrive here in July, is a special cabin fitted for a dental parlor for the accommodation of passengers.

At the port of Boston for the week ending May 29, imports amounted to \$1,520,259, against \$2,685,842 for the corresponding week of last year. Exports for the same week of this year amounted to \$1,756,531 as against \$2,644,401 for the same week of last year.

Commander C. J. Boush, in charge of this lighthouse district, gives notice that on or about June 17, Handkerchief lightship No. 4 will be temporarily withdrawn for repairs, and the station will be marked by relief light vessel No. 9. The latter will have the same characteristic lights and fog signal as light vessel No. 4.

Notice is also given to shipping interests that the fog signal apparatus on Hens and Chickens lightship No. 86 is deranged and cannot be relied upon to sound correctly the characteristic fog signal. The defect will be repaired as soon as possible.

On or about June 17 Shovelful Shoal lightship No. 1, Nantucket sound, will be withdrawn for repairs, and the station will be temporarily marked by relief lightship No. 9, which will have the same lights and fog signals.

Pollock Rip Shoals lightship No. 73 will be returned to her station about June 14 and the relief lightship now marking that location will be withdrawn.

President Huntington of Boston University preached a significant sermon at the baccalaurette service for the graduating classes of all departments of the institution in Jacob Sleeper Hall, June 1. He said in part:

"Our strenuous president asks for battleships, but we must remember that he helped to close the deadly strife between Russia and Japan by arranging for the treaty of Portsmouth, and his military provisions are only meant to make peace more impossible to disturb."

In a letter received at Provincetown from Captain Dunham of the whaling schooner *William A. Grozier*, dated May 29, it was learned that in 23 days, 135 barrels of sperm oil have been se-

cured by the crew of the *Grozier*. The whaling schooner *Ellen A. Swift*, which was also on Hatteras ground in company with the *William A. Grozier*, had succeeded in gathering 85 barrels of sperm oil.

Civil Engineer Ernest R. Gaylor, U. S. N., who has been at the New Orleans naval station for the past couple of years, has been transferred to the Boston navy yard as assistant head of the yard and dock department at that yard.

The Italian bark *Pietrina* of 1,243 gross tons has been chartered by local parties to load a cargo of lumber for Rosario, South America, at the rate of \$8 per 1,000 ft. This is the lowest rate paid for some time past, \$10 being paid for the last charter to Rosario.

A detachment of 22 marines under command of Sergt. Barrett has departed from the Boston navy yard for Panama, going via New York on the *Tacoma*. The entire number of their own free will volunteered to be transferred.

The former Gloucester fishing schooner *Olga*, has been purchased by Captain E. Krauss of Punta Arenas, and is now about to sail for Chili via the Straits of Magellan to Punta Arenas. On her voyage to Chili the *Olga* will carry 15 crates of household furniture, and will also take on 50 tons of bituminous coal for ballast. A company has been incorporated called the Chilean Commercial Co., with a capital of \$1,000,000. Among those interested are Charles Benson of Chicago, John Lockett and Charles Duval of San Francisco, and John Davis of Pittsburg. The associates of Captain Krauss will make the trip with him in the *Olga*, which has been fitted with a 60-H. P. gasoline engine to be used during calm spells. Mrs. Katherine Krauss, his young wife, will also be a passenger. The vessel will engage in carrying sheep from Patagonia to Valparaiso, and on her return voyages will carry general freight. Prospecting for gold which ought to succeed with the aid of such a craft as the *Olga* will no doubt be attempted.

The U. S. S. *Salem* (scout cruiser) being built by the Fore River Ship Building Co. is now engaged in running off her trials in Massachusetts bay.

THE FUNDAMENTAL PRINCIPLES OF GEOMETRY.

If the equatorial circumference of the earth is 25,000 miles, how many miles apart are two places on the equator, the distance between them being 20° ?

$20^\circ = 1/18$ circle. Ans. 1,388.8 miles, nearly.

What is the length of a degree on a circle whose diameter is 18 ft.?

The 60th parallel of latitude is a circle one-half as long as the equator. How many miles due east of Christiania is St. Petersburg, both situated on this parallel, the former being 10° east of Greenwich, and the latter 30° east? Ans. 691,160 statute miles.

1° on the circumference of a circle is 5 in. What is the length of the circumference? Ans. 150 ft.

The circumference of a circle is 9,000 ft. What is the length of 1° , $1'$? Ans. 25 ft.; 4 ft., nearly.

How many degrees are there between XII and the I on the face of a clock? Ans. 15° ; between XII and VI? Ans. 90° ; between the XII and III? Ans. 45° .

If one degree of the earth's circumference is $69 \frac{1}{6}$ statute miles, find the length of the circumference.

Through how many degrees does the minute hand of a clock pass in 1 hour? in 15 minutes? in 5 minutes? in 10 minutes? in 1 minute? in 3 minutes?

How angles are measured:

When the ends of two straight lines meet they form an angle. On the compass a line from the center drawn through North and NE forms an angle of 4 points or 45° .

The angle formed by the lines ST and TU may be called the angle T . It is frequently better to call it the angle STU or UTS , the letter at the vertex being placed between the two others.

The use of the three letters is necessary where two or more angles have vertices at the same point, as in the accompanying figure, where UX , VX , and WX meet at the point X .

The angle at the center of a circle has the same number of degrees as the arc between the sides of the angle.

Thus, in the following figure the angle AOF has the same number of degrees or points as the arc AF , or the arc ABC , or the arc CD .

1. How many degrees in the angle T , if S contains 75° ?

V measures 110° . How many degrees does U measure?

If one of two supplementary angles measures $63\frac{1}{2}^\circ$, how many degrees are there in the other angle?

How many degrees are there in an angle supplementary to one of $47^\circ 45'$?

2. Construct angle 5, 60° ; angle 4, 50° . Measure angle 3.

How many degrees and minutes will there be in angle 5 when 3 contains $49\frac{1}{2}$ and 4 contains $83\frac{3}{4}$?

When angle 3 contains $36^\circ 30'$ and angle 5 contains $79^\circ 45'$, how many degrees and minutes will angle 4 contain?

3. Erect a perpendicular at each extremity of a horizontal line. At each extremity of a vertical line. At each extremity of an oblique line.

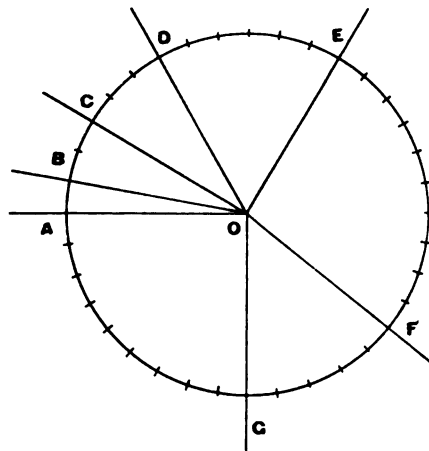
Note.—A line making a right angle with another line is said to be perpendicular to it.

4. Construct a square upon a horizontal line. Upon an oblique line.

5. Draw two lines intersecting at an angle of 100° . Mark in each of the other three angles the number of degrees it contains.

6. Draw two lines making an angle (6) of 150° . Construct an adjacent angle (7) containing 80° . How many degrees will angle 8 contain?

7. How many degrees will there be in the sum of five angles having the same vertex?



The circumference of this circle is divided into 36 equal parts. How many degrees are there in each part? How many degrees are there in each of the following angles?

AOB , BOC , COD , DOE , EOF , FOG , GOA , AOE , DOF .

8. Draw a line, AB , meeting a horizontal line, BC , at an angle of 58° . Draw a third line, DE , parallel to the horizontal line, and cutting the oblique line. What angles does it make with the oblique line?

Draw a fourth line, FG , parallel to the oblique line, and cutting both horizontal lines.

Mark in each of the 12 angles the number of degrees it contains.

9. QR and UV are parallel lines, cut by a line ST . If the angle b measures 50° , how many degrees does a measure?

Find the number of degrees in each of the other six angles.

TRIANGLES.

10. Construct a triangle, KLM , making the angles at the base 28° and 120° , respectively. Draw NO , parallel to LM .

Is the angle e equal to any angle of the triangle? How many degrees does it contain? Is the angle f equal to any angle of the triangle? How many degrees does it contain?

How many degrees are there in the sum of the angles e , g , and f ? How many degrees are there in the angle g ?

11. How many degrees are there in the three angles of any triangle?

12. Two angles of a triangle measure 36° and 65° , respectively. How many degrees does the third angle contain?

13. Draw a triangle containing two angles of 50° and 70° , respectively. How many degrees are there in the third angle?

Measure each side, and mark on the side its length.

Opposite which angle is found the longest side? Opposite which, the shortest side?

14. Draw a triangle having two angles of 75° each. Are any two of its sides equal?

Draw a triangle having two angles of 50° each. Are any of its sides equal?

15. Draw a triangle having two angles of 60° each. How many degrees does the third angle contain?

Are any of its sides equal?

16. If a triangle has two of its sides equal, what is true of its angles?

17. If a triangle has three of its sides equal, what is true of its angles?

A triangle having all its sides equal, is called an *equilateral* triangle.

A triangle having two equal sides, is called an *isosceles* triangle.

A triangle having all its sides unequal, is called a *scalene* triangle.

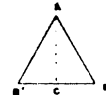
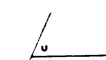
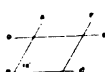
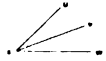
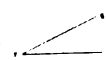
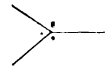
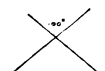
18. How does a perpendicular let fall upon the base of an isosceles triangle from the opposite angle divide the angle? How does it divide the base? How do the angles at the base of an isosceles triangle compare with each other as to size?

The *unequal* side of an isosceles triangle is called the base.

19. Draw an isosceles triangle having the base a vertical line.

An isosceles triangle having the vertex below the base.

One having an oblique line for the base. Draw a right-angled isosceles triangle.



How many degrees will there be in each of the other angles?

Draw an obtuse-angled isosceles triangle.

20. How many degrees will there be in each angle of an equilateral triangle?

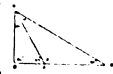
Draw an equilateral triangle having one side vertical.

Draw an equilateral triangle having its vertex below the base.



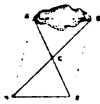
21. DEF is an isosceles triangle, DF and EF being the equal sides. If the angle D measures 50° , how many degrees are there in each of the other five angles, when the line FG bisects the base?

22. ABC is a right-angled triangle, the angle at B measuring 90° , and the angle at C measuring 30° . If the line AX is so drawn as to make the angle AXB equal to 60° , find the number of degrees in the angles m , n , and p , respectively.



23. Construct two triangles with equal bases, and angles at the bases respectively equal. Are the triangles equal?

24. A person wishing to ascertain the length, AB , of a pond, places a pole at a convenient point, C , visible from A and B . The distance BC is measured, and a pole is set up, on a line with B and C , at D , the distance CD being made equal to BC . A pole is also placed at E , on a line with A and C , the distance CE being made equal to AC .



Can you show that the length, AB , of the pond can be ascertained by measuring the distance DE ?

ANSWERS.

1. 105° , 70° , $116\frac{1}{2}^\circ$, $132\frac{1}{4}^\circ$. 2. 70° , $46\frac{3}{4}^\circ$, $63^\circ 45'$. 5. 80° , 100° , 80° . 6. 130° . 7. 360° . 10. $g = 32^\circ$, $e = 28^\circ$, $f = 120^\circ$. 11. 180° . 12. 79. 13. Opposite the angle 70° , opposite the angle 40° . 16. Angles will be equal. 17. Three angles are equal. 20. 60° . 21. 310° , 2 and 3 are 90° each, 5 and 6 are 40° each, and 4 is 50° . 22. m equals 30° , n equals 30° , since AX and CX are equal sides, their angles are equal, or before AX was drawn B and C equalled 120° , A would equal 60° , BX equals 150° , m equals 30° . 24. AE and BD are the same as the diagonals of rhombus, the diagonals of a rhombus divide into two equal angles; DE equals AB .

The plant of the Manitowoc Steam Boiler Works has been purchased by a new company, organized by the officers of the Manitowoc Dry Dock Co. The promoters of the company are Elias Gunnel, L. E. Geer and Charles West. Both plants will be virtually under one management, forming a combination capable of building a vessel complete.

QUESTIONS FOR MASTERS AND MATES—NO. 1.

1. What is the difference between $NNE \frac{1}{2} E$ and $NE \times N \frac{1}{2} N$?

2. You have corrected your chart course for variation and deviation and you find the course to be $ENE \frac{3}{4} E$ by compass. What course would you give the wheelsman to steer; that is, how would you read the compass to him?

3. For practical purposes how much is 3° equal to in fractional points of the compass?

4. How many three point courses are there, and what are they?

5. Why is it that the variation of the compass is the same on every point of the compass at the same place, no matter in which direction the ship may be heading, but the deviation is different for different headings of the ship, yet the ship practically remains in the same locality?

6. What is the lubber point on the compass; what does it represent, what is it used for, and where is it located?

7. How many degrees in $1\frac{1}{4}$ pts.?

8. How do you know there are $11\frac{1}{4}$ degrees in one point of the compass?

9. If your boat made 22 miles in 1 hour and 25 minutes, how fast is she running per hour?

10. How do you know that $11\frac{1}{4}$ statute miles equal 10 knots?

11. You are steering $S \frac{1}{4} W$ and heading directly on Wind Pt. light; distant from it 10 miles, what course must you steer to pass 2 miles outside of it?

12. Which way do you move on the compass card to go Wly from S; which way to go Ely from S?

13. A boat steaming at the rate of 11 knots makes how many knots in 7 hrs. 30 min.? How long will it take a boat steaming 11 statute miles per hour to steam the same distance?

14. With Vidal Shoal ranges over your stern your compass reads $W \frac{1}{2} S$. What is the dev.; what point of the compass is this dev. for, and what course would you have to steer by this compass to make good the true course of $WSW \frac{1}{4} W$ between Eagle Harbor and Devil's Is.?

15. You have steered $N \times E \frac{1}{4} E$ from Chicago to Pt. Betsey, but find yourself 14 miles off the Point instead of 4 miles. How much is your compass out of the way; which way, and what course should you have steered to be off the Point the required 4 miles?

16. The true bearing through the Sturgeon Bay ship canal is $NW \frac{1}{4} W$, the var. is $2\frac{1}{4}$ degrees Ely. How should you head going through the

canal if your compass was free from deviation; if your compass read $NW \frac{1}{4} N$ when going through the canal, how much and which way is the deviation?

17. $N \times E \frac{1}{2} E$ makes a good course Chicago-Pt. Betsey. How much dev. has that compass on that heading and which way is it?

18. Define true course, correct magnetic course and compass course and tell which is each and how you get or find them.

19. Starting from E on the compass, where will 2 points Ely. fetch you?

ANSWERS TO QUESTIONS FOR MASTERS AND MATES—NO. 1.

1. None.

2. $E \times N \frac{1}{4} N$ the lake way; $ENE \frac{3}{4} E$ the navy way.

3. $\frac{1}{4}$ point.

4. Four— $NE \times N$, $NW \times N$, $SE \times S$, and $SW \times S$.

5. Because the magnetic poles of the earth to which the compass magnet directs itself are fixed to all intent and purpose, and retain the same bearing from any one spot on the earth's surface. While the deviation is caused by the ship's magnetic poles, which are located somewhere within the hull, consequently when the ship's head is moved in azimuth the ship's poles occupy a relatively different position from the compass needle with each such change.

6. A vertical black line located on the inside surface of the compass bowl with its lower end even with the edge of the card. It represents the ship's head and the line of the keel. Its use is to keep the ship on her course by keeping the compass point representing the course to be steered in line with the lubber point.

7. $14^\circ 03' 45''$.

8. The compass being a complete circle contains 360 degrees, and is divided into 32 points. Therefore 1 point equals $1/32$ of 360° , which is $11\frac{1}{4}^\circ$.

9. 1 hr. 25 min. equals 85 min. $85:60::22:15.5$ miles. Ans.

10. One nautical mile equals 1.15 statute miles. $11.5 \div 1.15$ equals 10 knots.

11. $S \frac{1}{4} E$. Starboard 1 point. Roughly 1 point makes a difference of 20 miles in a hundred. 2 miles are $1/10$ of 20. As you have 10 miles to run, 1 point makes a difference of 2 miles in 10.

12. To the left. To the right.

13. 11×7.5 equals $82\frac{1}{2}$ knots. $82\frac{1}{2}$ knots equal 94.8 statute miles.

11)94.8(8.6 hrs. equals 8 hrs. 36 min.

14. Dev. is $\frac{1}{2}$ pt. Wly. Dev. is for

W x S. True course WSW $\frac{7}{8}$ W. Mean var. $\frac{3}{8}$ pt. Ely. Corr. magnetic course W x S $\frac{1}{2}$ S. Dev. $\frac{1}{2}$ pt. Wly. Compass course W x S.

15. Compass is $\frac{1}{4}$ pt. out. Wly. Required course, N x E $\frac{1}{2}$ E.

16. NW $\frac{3}{8}$ W (nearly). Dev. $\frac{5}{8}$ pt. Wly.

17. $\frac{1}{4}$ pt. Wly.

18. The true course is the angle made with the true meridian by a straight line drawn on the chart between the ship's position and the point aimed for. It is the course laid on the chart and measured from a true meridian. The correct magnetic course is the true course corrected for variation. The compass course is the correct magnetic course with the deviation for that heading applied. The compass course may be the course steered by compass affected by both variation and deviation. Get the true course from the chart. Applying var. as per chart gives the correct magnetic course. To the correct magnetic course apply the dev. for that heading and you have the compass course.

19. ESE.

ITEMS OF GENERAL INTEREST.

Major Graham D. Fitch, United States government engineer at Duluth, has asked bids for removing the wreck of the steamer Sevona, sunk $1\frac{1}{2}$ miles northeast of Sand island in the Apostle group, Lake Superior. The stern of the wreck is in 18 ft. of water and the bow in 22 ft.

Capt. Muller, government compass adjuster, with headquarters at Toronto, has been appointed Canadian inspector of the British Marine Underwriters Association.

The Reid Wrecking Co., of Sarnia, will raise the schooner George G. Houghton which sank near Bar Point last fall while being towed to Toledo with a cargo of salt.

Contracts will be awarded by the government shortly for the building of 12 steel steamboats for artillery service for various parts of the United States, two of which will be stationed on the Pacific coast. The boats are to be 90 ft. long, 22 ft. wide and 8 ft. draught, and will cost approximately \$60,000 each.

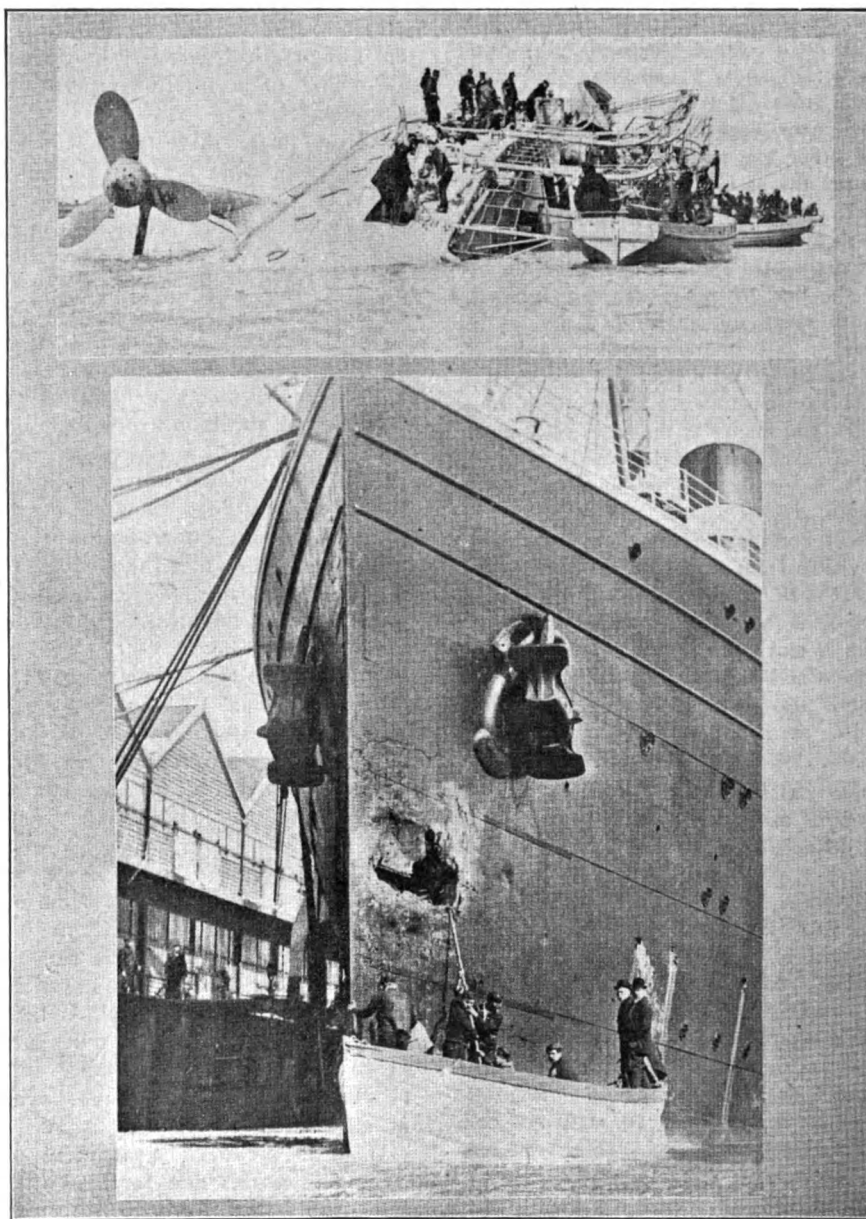
Barclay, Curle & Co., Glasgow, recently launched the Principe di Udine for the Lloyd Sabauda, the fast Italian mail service between Italy and the United States. The latter-day steamer endeavors to cater to all possible wants, a number of them having palm gardens, candy stores, Turkish bath and the like, but this steamer is the first to be equipped with a dentist's office.

Owing to the shifting of the coal-

laden cars composing part of the cargo of a large float belonging to the Brooklyn and Eastern District Terminal Co., the float overbalanced and sank in the East river, New York, off the Williamsburg dock. There were 20 cars on the float, nine loaded with coal, 10 with barrel staves, and one

off Gloucester and was driven ashore on the eastern side of the channel.

The Norwegian steamship Harald, from Santiago de Cuba with 4,800 tons of iron ore, arrived at the Port Richmond piers, Philadelphia, on Friday. The work of discharging began at 2:30 p. m. the same day and completed



The above view shows the wreck of the second-class cruiser Gladiator, of 5,700 tons displacement, attached to the Portsmouth division of the Home Fleet, which on Saturday afternoon, April 25, while returning from Portland, came into collision in the narrow waters of the Solent, unfortunately with the loss of between 30 and 40 lives, with the American liner St. Paul, outward bound through the Needles. The liner, as shown above, had her bows badly buckled.

contained 30 Texas steers. The cattle doors were opened, and about half of the steers got out and swam ashore. The loss is believed to be about \$35,000.

The Dutch steamship Tromp, from New York in ballast to load for the West Indies, during the gale of Saturday night went ashore in the Delaware river. The Tromp was at anchor

on Saturday, the vessel leaving immediately for Louisburg, Cape Breton. For quick loading and discharging Philadelphia can certainly hold her own along the coast.

The Niagara Navigation Co. of Toronto has just issued a bulletin announcing the opening of their service connecting Buffalo, Niagara Falls and Toronto.

NEW CITY OF CLEVELAND.

The new steamer City of Cleveland reached Cleveland on Tuesday morning on her initial trip to Lake Erie with practically every state room filled and having aboard a delegation of the city officials of Cleveland. On Tuesday afternoon a complimentary excursion was given to about 3,000 Clevelanders. Just prior to leaving the dock the colors for the steamer which had been supplied by the city

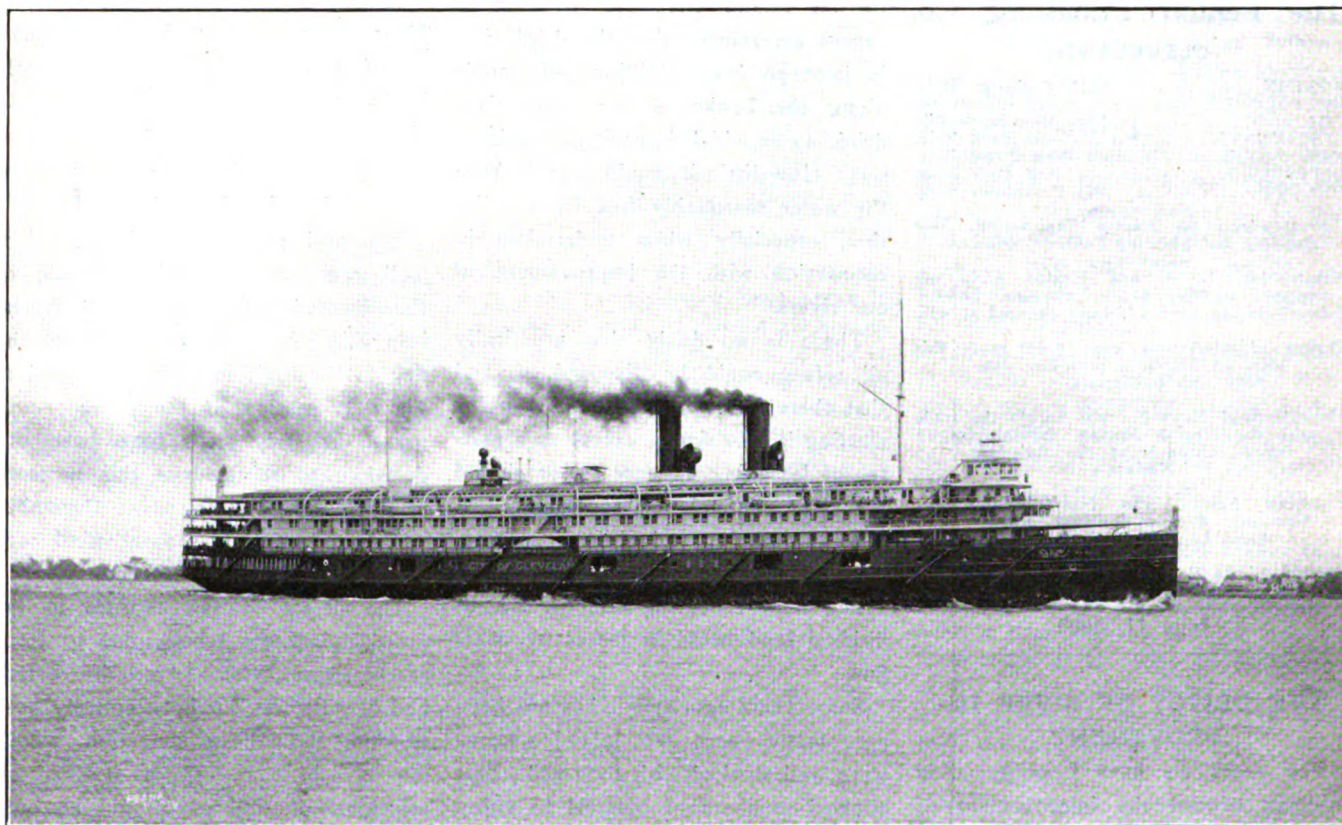
level with the floor of the Superior street viaduct. She is the biggest side-wheeler on the lakes, her launching weight being equal to the combined weight of the steamers Eastern States and Western States. Her weight with machinery and full equipment aboard is 9,000 tons. She is 402 ft. over all, 390 ft. keel, 54 ft. beam, 91 ft. 6 in. over guards and 22 ft. deep. She is the acme of comfort in traveling. The state rooms have running water and

503. What is the reverse true course from Pt. Betsey to Chicago?

504. What is the true course from a point $4\frac{1}{2}$ miles W. of Pt. Betsey to North Manitou Island gas buoy?

505. What is the true course from Manitou Island SE Shoal to Grays Reef lightship?

506. On the course from Pt. Betsey to North Manitou Island gas buoy how far are you off Sleeping Bear when abreast of it?



THE NEW PASSENGER STEAMER CITY OF CLEVELAND, TAKEN WHILE OFF MARINE CITY.

Pesha photo.

council, were presented to the steamer by Mayor Johnson. There was no ceremony about this as the mayor had other pressing engagements and could not go out into the lake on the new steamer. The colors were therefore presented by the mayor in the presence of a small gathering on the hurricane deck and were accepted by A. A. Schantz, the general manager of the Detroit & Cleveland line. The colors are beautiful and the workmanship excellent. Among the Detroiters making the trip were P. H. McMillan, president of the company; Frank E. Kirby, designer of the boat, and Walter Campbell, manager of the Detroit, Belle Isle & Windsor Ferry Co.

Expressions of surprise were heard on all sides at the extraordinary advance which the new steamer marks over any side-wheeler on the lakes. The top of her pilot-house is on a

telephones, while her steadying tanks make her extremely easy in seaway. Aside from the smoking or observation room there are quite a number of reading and writing rooms and cozy corners.

Capt. A. J. McKay, commodore of the fleet, says that the steamer has behaved magnificently throughout all her tests. As soon as the season is on in full swing she will make two trips a day between Cleveland and Detroit.

QUESTIONS FOR WHEELSMEN AND WATCHMEN.

500. What is the true course and distance from Pt. Betsey to Chicago?

501. What is the mean correct magnetic course from Pt. Betsey to Chicago?

502. How do you determine it?

507. How does Sleeping Bear bear from South Manitou Island light?

508. How does Manitou SE Shoal gas buoy bear from North Manitou Island lighthouse?

509. Name the shoals in Manitou passage?

510. What is the distance from Sleeping Bear to Manitou Island Shoal gas buoy?

ANSWERS.

489. 11.4 miles.

490. 4.17 hours, or about 4 hrs. 12 min.

491. Four marks, 7, 10, 13 and 15.

492. None.

493. West.

494. 315 degrees.

495. Nothing.

496. $\frac{1}{8}$ -pt.

497. Nearer to $\frac{1}{4}$ -pt.

498. SW.

499. $9^{\circ} 51' 30''$.



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THE OBJECT OF RIVER IM- PROVEMENT.

For years we have been spending millions toward the improvement of our rivers for navigation interests, and at the same time neglecting other important uses of the rivers. Cheap transportation is undoubtedly one of our principal needs, and the improvement of our inland waterways will do much toward supplying it. But why not take full advantage of the money which is being spent for this purpose? It must not be overlooked that river improvements in this country have proved very expensive, not only in first cost, but in maintenance.

Unfortunately, while we are improving the rivers, the railroads and others are throwing refuse into them and filling in over their banks; all of which is to the detriment of the works of improvement. The iron mills and factories drain acids and other injurious waste into the rivers. Not only do they injure the public works,

but they make the water unfit for drinking purposes and destroy the fish.

In connection with these river improvements, why cannot the subjects of water supply and fish culture be considered? They are surely deserving of serious study, and they are absolutely necessary for our well-being. When one stops to think of the water which the people of many of our inland cities are drinking, it causes amazement that the death rate is kept so low. Millions of people along the banks of the Ohio river drink water which is positively poisonous. How little it would cost to keep the water reasonably free from pollution, especially when undertaken in connection with the improvement of our rivers.

There is no doubt that practically all refuse could be disposed of, and that there is no necessity, in fact, for wasting it into rivers, except as a matter of lessening expense. Nor should the river channels be contracted further by dumping and filling. Contraction has cost the people of the Ohio valley many times the value of the additional land made in losses by overflow.

Some years ago, and it has not been very many years, our inland streams were well stocked with food fish. This allowed numbers of persons to enjoy that nutritious food, lessened the consumption of meat, and provided outdoor sport for millions. What have we today? The better species of fish have been destroyed; they cannot live in the waters of our larger streams. Those fish that remain in rivers, with well populated banks, are not as a rule fit for food.

The value of a pure water supply cannot be estimated in dollars and cents. While this water-supply question may be considered more of a state than of a national issue, nevertheless as the government has control of the rivers, it should consider the water supply in connection therewith.

We have been experimenting with river improvements for over 30 years; yes, over 50 years. Should we not expect reasonable results? Why not make the improvements complete;

why not consider them from every viewpoint? Give us a department of public works, so that these matters can be taken up and considered as their value to the nation demands, not as politics dictate. Such a department would be invaluable; it would lessen the cost of our improvements; it would bring under one head works that should be considered as a whole.

It is gratifying to note that the president has called attention to the matter of water supply, but unfortunately he has overlooked that of fish for our rivers.

THE SHIPPING BILL.

The saying that hope is eternal is well exemplified by the attitude of the devoted defenders of the American ship whose efforts to restore the flag to the high seas were defeated at the first session of the present congress. Already steps have been undertaken to reintroduce this measure at the closing session next December and to fight for its passage until congress itself is extinguished.

The defeat of the measure in the first session was wholly due to Representative Burton. It is quite certain had Mr. Burton not been actively hostile the Republican defection would not have been as large as it was. In attacking the bill as he did he outraged the feelings of his own constituents and by his attitude deprived the city of Cleveland of a representative in congress.

That bill should have passed. It was a sensible measure. It sought to remedy a condition from which the whole country is suffering. It provided merely for the transportation of the mails in American ships to commercial ports not now reached by them. It provided also that the service should be paid for out of the profits of sea postage. It did not contemplate the subtraction from the public treasury of a single cent. On the contrary if passed it would have greatly stimulated industry because in order to fulfil the provisions of the bill it would be necessary to construct a score of steamers. A ship cannot be built without giving em-

ployment in one way or another to every industry in the country. A ship is the most self-contained thing that a man creates and in order to be self-contained there must enter into it everything that enters into the structure and maintenance of a city. How any man, having the interests of his country at heart, can vote against this measure is past all fathoming.

LAKE FREIGHT SITUATION.

It is now expected by leading vessel interests that navigation will generally open on Monday next, June 16, though virtually that means anywhere from June 23 to July 1, as it will take some time to get the ships in readiness to leave after the men have been ordered to them. It is also expected that the season will be reasonably active after it is once open. There is practical necessity for the movement of ore in the immediate future if some of the mines are to continue to operate as they have nearly reached the limit of their storage capacity. It is expected that orders for ore will immediately follow the definite acceptance on the part of the iron mining companies of a general reduction of 50 cents per ton for iron ore. The iron ore companies will probably accept this reduction without protest in line with the general reduction in the price of finished products, though in actual practice the reduction works out a greater figure than 50 cents.

The output of the iron ore companies obviously will be less this year than last while the overhead charges remain the same. It has already been agreed that wages are not to be reduced and the fixed charge of operation is upon the same scale as last year. The cut of 50 cents a ton to the purchaser really means about 75 cents to the mining company. The iron ore interests have talked the situation over among themselves for the past 10 days and while not all of the iron ore men are in Cleveland at present it is not expected that this reduction of 50 cents will be opposed. Now that the bottom of prices has been reached iron ore interests are hopeful that business will be done. At the most there are only five months left of the lake season and during part of which rough weather is sure to be experienced and possibly also some friction with labor. While the lake fleet is capable of handling readily 25,000,000 tons of ore during the balance of the year, the receiving docks will be somewhat taxed to take care of it. Conditions are not very favorable for dispatch on the docks this year.

The ore shipments for May amounted to only 285,315 tons, a loss of 5,335,970 tons compared with May, 1907. The shipments to June 1 are 285,315, a loss of 5,966,946 compared with the same period of 1907. The shipments by ports were as follows:

	May, 1906.	May, 1907.	May, 1908.
Escanaba	680,400	722,516	16,245
Marquette	319,171	366,826	
Ashland	497,760	479,924	21,128
Superior	657,924	994,504	132,818
Duluth	1,140,761	1,835,921	86,691
Two Harbors ...	1,008,838	1,221,594	28,433
Total	4,304,954	5,621,285	285,315

	To June 1, 1906.	To June 1, 1907.	To June 1, 1908.
Escanaba	923,744	1,014,339	16,245
Marquette	404,397	376,873	
Ashland	632,062	495,194	21,128
Superior	868,187	1,101,183	132,818
Duluth	1,524,404	1,937,830	86,691
Two Harbors ...	1,399,546	1,326,842	28,433
Total	5,752,340	6,252,261	285,315

Shippers have gradually during the past week been putting their ships in commission, and the Pittsburgh Steamship Co. expects to have its barges in operation by the end of the month. Coal is coming forward very freely, especially at Cleveland, which is caring for shipments that have hitherto gone to Ashtabula, the docks at that port being out of commission. The coal movement during 1908 will be very heavy and will keep the smaller class of vessels quite busy, and for a few trips the large ones as well.

IRON AND STEEL SITUATION.

The action of the steel manufacturers, June 10, in reducing the price of billets \$3 a ton, sheet bars, plates, structural shapes and wire nails \$2 a ton, and merchant pipe \$4 a ton, was made inevitable by the concessions announced on steel and iron bars last week. The reduction is welcomed by the trade, as the market has been stagnant for the past week. Opinions of consumers differ as to whether some of the reductions are adequate. Despite the dullness in finished lines, the pig iron market has shown increased strength, and a fair volume of tonnage has been sold. It is not anticipated that the reductions in the prices of ore will have any important effect on the pig iron market, pig iron prices having already declined sharply. Old material, both steel and iron, shows more activity. There is some improvement in foundry coke, and although prices are firm, consumers are closing for their requirements for 12 months.

The steamer Wm. H. Wolff left Lorain on Friday last on her maiden trip carrying coal to Milwaukee.

MAY LAKE LEVELS.

The United States Lake Survey reports the stages of the great lakes for the month of May, as follows:

Lakes—	Feet above tide water, New York.
Superior	602.07
Michigan-Huron	581.36
Erie	573.51
Ontario	248.46

Since last month Lake Superior has risen $4\frac{3}{4}$ in., Lakes Michigan and Huron have risen $6\frac{1}{2}$ in., Lake Erie has risen $3\frac{1}{2}$ in., and Lake Ontario $5\frac{1}{4}$ in.

During the present month all the lakes should rise about as follows: Lake Superior $3\frac{1}{2}$ in., Lakes Michigan and Huron 3 in., Lake Erie $2\frac{1}{2}$ in., and Lake Ontario 1 in.

Lake Superior is $8\frac{1}{2}$ in. higher than in May, 1892, $4\frac{1}{2}$ in. higher than 1898, and about the same height as in 1889 and last year; but it is 5 in. lower than in 1906 and 1907, and $3\frac{1}{4}$ in. lower than the average May height of the past 10 years.

Lakes Michigan and Huron are $21\frac{1}{2}$ in. higher than in May, 1896, 3 in. higher than a year ago, $1\frac{1}{2}$ in. higher than in 1906, nearly 8 in. higher than the average May stage for the past 10 years, but lower by 26 in. than in May, 1886.

Lake Erie is over 2 feet higher than in May, 1895; $7\frac{1}{2}$ in. higher than last year; over 2 in. higher than in 1904; over a foot higher than the average May stage of the past 10 years, and is the highest May water since 1890, when it was $1\frac{1}{2}$ in. higher. In May, 1887, the lake was $6\frac{1}{2}$ in. and in 1876, 11 in. higher.

Lake Ontario shows the highest May stage since 1886, when it was $2\frac{1}{4}$ in. higher. It is $25\frac{3}{4}$ in. above the average May stage of the past 10 years, $16\frac{1}{2}$ in. higher than last year, and 10 in. higher than in 1904. Unless unusually heavy rainfalls should prevail, Lake Ontario will not go much higher this year.

PERSONAL.

A. G. Smith has resigned as superintendent of the Chicago yard of the American Ship Building Co., at South Chicago, and he will engage in business for himself as naval architect and marine surveyor. Hugh L. Tims, superintendent of the Bay City yard of the American Ship Building Co., will succeed Mr. Smith at the South Chicago plant.

The tug Tom Dowling sank at her dock at Ashland last week. Capt. Albert Ceal was asleep in the cabin but was awakened by the noise of rushing water and had barely time to open the cabin door before the tug sank. The tug lies in 20 ft. of water.

The Honorable Peter White

The Honorable Peter White died as he had lived—in the harness, working unceasingly to the end. He was in Detroit on Saturday last attending a meeting, at the city hall, of the Mackinac Island park commission, of which he had been president for the past 12 years. Complaining of pains in the chest which he attributed to a slight attack of indigestion he said that he would go to his room at the Hotel Ponchartrain to get some medicine to relieve the distress, remarking that he would return in a few minutes. He had proceeded down the circular walk leading from the city hall but a few feet when he sank to the ground and expired before help could be secured. The body was carried into Mayor Thompson's office and was taken to Marquette in Henry Russel's private car attached to the northbound Michigan Central train that evening, accompanied by Henry M. Campbell and John R. Russel. The funeral occurred at 2 o'clock Tuesday afternoon.

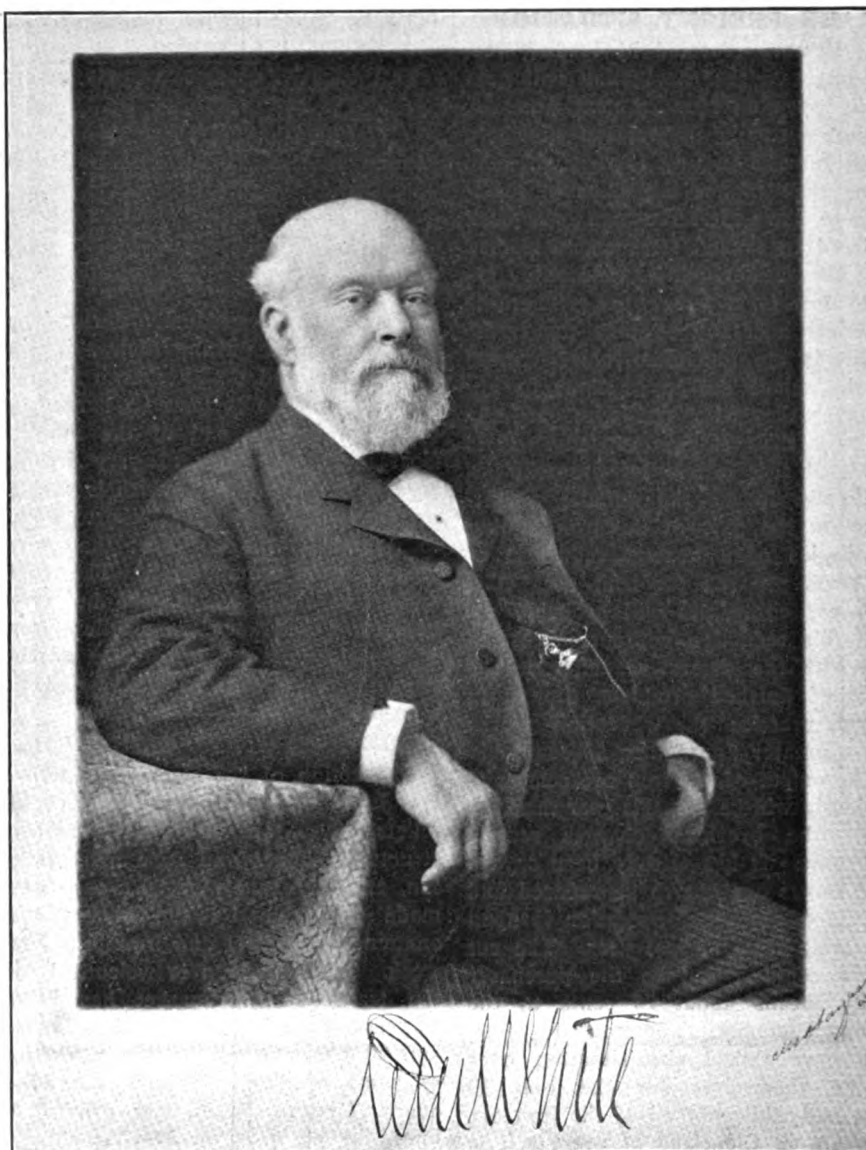
There seems much that is sad and shocking in such swift overtaking by death; but nevertheless it was the inevitable end of Peter White. His activity was incredible. Work was life with him. Not to work was not to live. To what reaches he carried his activity long after he had passed the allotted span of three score years and ten is not readily believable by those that did not know him. He worked early and late, and midnight frequently found him writing busily at his desk. This habit of industry was lifelong. It marked every step of his progress through the world. In every phase of his life he unconsciously exemplified the divine command: "Whatsoever thy hand findeth to do, do it with all thy might."

The life of Peter White is an inspiration. He had none of the so-called advantages of early training. Such advantages as he possessed nature gave to him. Whatever he got he won through his own efforts unaided. He left home at the age of 15 years and made his living out of a comparative wilderness. That he should also out of that same environment acquire a refinement, culture and breadth of knowledge that was notable among men, was a more distinct achievement than the winning of a fortune.

Peter White was an unusual man and his career is one of the romances

of American history, picturesque and uplifting. He was a prince among his fellows. His position in contemporaneous history is unique. It is unique because he was both a participant and a spectator of the greatest industrial development that the world has ever

complex machinery of the iron trade, developed under his very eyes. But the potentiality of what he saw is greater still. It has lifted the United States to the pinnacle of commercial supremacy and has made it the premier iron-making country of the



experienced. It is not surprising that legend and tradition should associate him with the upper peninsula since time immemorial. While he would not have reached his seventy-eighth birthday until October next, his life embraced all that was commercial in the history of Lake Superior. He was there when that mighty lake bore nothing greater than the birch bark canoe of the Indians, and all that has happened since, the building of towns, the network of railways, the great fleet of ships, and all the vast and

world. As he exclaimed at the Semi-Centennial Celebration of the completion of the first canal at Sault Ste. Marie to commerce: "This vast landlocked sea with all its tributaries is free, and its freedom means these infinite results—the greatest addition to freedom since freedom came. And we who have seen its development and have worked the forests and mines which have chiefly made its commerce may pause in wonder that so few and feeble a people living under so cold a sky should have been permitted to

share so largely in changing the seat of empire and enlarging the happiness of the world."

The upper peninsula of Michigan came to be known in common speech as "Peter White's Country." In fact, the history of the peninsula is the history of Peter White. He stamped his personality indelibly upon its rugged surface. He identified himself thoroughly with every department of it, and he did more for it than any American has ever done for so large a section of a state. He worked for it unceasingly. In fact, after his business affairs had become so soundly established as to require his time merely in an advisory capacity, he labored incessantly for the development of the upper peninsula, socially and politically. At a time of life when most men would be inclined to take their ease by the fireside, he thought nothing of journeying thousands of miles in behalf of some public enterprise. It was through his efforts alone that congress three years ago took steps to observe the Semi-Centennial of the Sault Ste. Marie canal. He spent many strenuous weeks between Marquette and Washington on this single mission. His whole life, in fact, was marked by public efforts equally as devoted and as unselfish.

The late Dr. W. H. Drummond, the Canadian poet, writing of him at the dedication of the Peter White Hall of Science at Marquette, said: "Strong in his gentleness, wise in his simplicity, practical in his enthusiasm. A pioneer in an age of pioneers, the man whom children on the street know only as Peter White, stands today, it seems to be, the very highest ideal of that civilization of which the American people are so proud. When such men build us foundations, easy it is to raise the superstructure, and the trail Peter White has cut through life is blessed by acts of private charity and deeds of public devotion that will serve as a guide to those who follow in the footsteps of a truly great, and above all, good man."

Don N. Dickinson suggested a few years ago that a monument should be placed at the entrance of Presque Isle Park where it would be seen by all men entering upon that beautiful spot, a colossal bronze statue of Peter White. "Let us have the sturdy figure," said he, "upon the sturdy legs, with the kindly face and in colossal bronze at the entrance of the park."

This, it seems to us, is the least that Marquette can do for the man that felled the first tree upon its site and who had been its life-long benefactor, identifying himself with every

phase of its civic life, founding hospitals, bequeathing libraries and maintaining parks.

It is difficult to compress into a brief article an adequate appreciation of this unusual man. He was born in Rome, N. Y., on Oct. 31, 1830. At the age of nine years his parents removed to Green Bay, Wis. When he was 15 he left home to seek fame and fortune and he found them both. He went to Mackinac Island and in the copper excitement then prevailing endeavored to join an exploring party, but without success. After waiting a while at Sault Ste. Marie he returned to Mackinac Island where he spent the next two years. In 1847 while visiting Sault Ste. Marie he secured a position on board the schooner *Bela Hubbard*, making about half a dozen trips on her between Detroit and Sault Ste. Marie. The schooner capsized off Thunder Bay Island, but fortunately no one was drowned. Peter White then went to Detroit nursing a broken arm which he had got by falling from a pile of lumber at Bay City after landing from the *Bela Hubbard*. When this was mended he obtained employment as clerk in the store of Freeman & Bro. on Jefferson avenue and remained with them for nearly a year. He then shipped with a man who was going to keep the government lightship at Waugoshance Reef in the Straights of Mackinaw, but when he reached Mackinac Island he found that the place had been filled. He obtained employment, however, with Capt. Canfield of the Light House Service who was building a crib on Waugoshance Reef and in the winter time served as clerk in the store of Edward Kanter. He was an unusually active lad and Capt. Canfield noting his efforts to improve himself in reading and writing gave him the position of timekeeper at a fair advance in wages.

His life work began, however, when Robert J. Graveraet appeared at Mackinac Island in 1849 in search of men to develop the iron mines which had just been discovered on the Marquette range. The journey from Mackinac Island to the Sault was made in a worthless little side wheeler known as the *Tecumseh*. The trip from Sault Ste. Marie to Indian Town (now known as Marquette) was made in a Mackinaw barge and was accomplished after eight days of strenuous rowing and poling. This party, consisting of nine men and the boy, Peter White, went to develop a mine on the site of the present town of Ishpeming. With this mine and the company that

subsequently proved its title to it, the Cleveland Iron Mining Co. now known as the Cleveland-Cliffs Iron Co., Peter White was identified all his lifetime. Obviously in such a primitive settlement all labor was manual, and Peter White did whatever came to his hands. There were no docks; passengers and perishable freight were landed in small boats; cattle and horses were pitched overboard to swim ashore.

Peter White's first job at the mine was driving a horse, his second a team of oxen, his third was filling the first steam boiler ever set up in the peninsula. It was likewise his first contract, for which he bid \$1.50, but it took him three days and two nights to fill it. As part compensation, however, he was installed as fireman and engineer, and only left this place to enter the machine shop to become a mechanic. Whatever he did he did it with energy and enthusiasm. One of his earliest experiences was making a trip for Graveraet overland from Marquette to Escanaba. This was a considerable undertaking for a boy of 18. After seven days of scrambling through thickets and floundering through swamps he reached Escanaba, then known as Flat Rock, and delivered his message. He had meanwhile secured a position as clerk in the store of A. R. Harlow, postmaster. Noting considerable unrest owing to the nondelivery and nonforwarding of mails he volunteered to act as mail courier and made a number of trips with Indians and dog sleds between Marquette and L'Anse. The mail was securely strapped to a sled, Peter traveling alongside of it on snow shoes controlling the leading dog by a string rein and using his staff to stop the sleigh by pushing it into the snow. The lore of the French-Canadian is filled with stories of Peter White and his Indians and his dog sleds. He later succeeded Mr. Harlow as postmaster at Marquette, occupying the position altogether 12 years.

There were no means at that time of getting the ore from the mines to the shore of the lake. Such haulage as was made was exclusively in the winter time in sleighs owing to the fact that the soft roads would not bear the weight of a wagon in the summer. Peter White wrote the bill of lading of one of the earliest shipments of ore—six barrels—consigned to B. L. Webb, Detroit, on July 7, 1852. This bill of lading has been preserved by Oglebay, Norton & Co. of Cleveland. It is impressive to think that Peter White lived to see 42,000,000 tons

shipped from this same iron country in a single year.

Peter White was by instinct a merchant and after having served a reasonable apprenticeship as clerk in Mr. Harlow's store he entered into the general merchandise business for himself. He conducted it with profit, but sold out when he saw a better opening in the insurance business. Insurance in those days, especially life insurance, was a new departure in commercial transactions, but Peter White undertook it with enthusiasm, and it is recorded of him that at one time he insured every person in the upper peninsula of Michigan. He later began the business of banking in a small way, later incorporating his institution into a national bank calling it the First National Bank of Marquette.

On Sept. 29, 1857, he married Ellen S. Hewitt, daughter of Dr. Morgan L. Hewitt, of Cleveland, the first president of the Cleveland Iron Mining Co. He built later on the Ridge in Marquette a splendid residence for her in which for 48 years she conducted an ideal home.

It was in 1857 that the land grant was transferred from Sault Ste. Marie to Marquette and Peter White was made register. A little later he added to his duties that of collector of customs of the port of Marquette, the city being made in that year a port of entry in place of Sault Ste. Marie. Evidence here displays itself of the exceeding alertness of his mind. His duties revealed to him the fact that there were constantly arising certain minor questions to be adjudicated, and he undertook the study of law, studying alone in the evenings. That he went at it with vigor is proved by the fact that the United States supreme court later admitted him into practice. He formed the law firm of White & Maynard, but eventually surrendered the entire business to his partner. He had natural gifts of declamation and oratory and it was his pleasure to commit standard addresses to memory. He was gifted with a fine sonorous voice and rendered them impressively. Three years ago in walking through the woods to his camp near Deerton with the writer he suddenly burst out with Mark Twain's *Apostrophe to Damascus*. The voice, the setting and the thought combined to make it tremendously impressive. Of these performances Peter White was especially fond and delighted his friends for hours together with his rare stories and recitations.

When the civil war was drawing to a close Peter White was among the few who perceived the enormous demand for iron that would follow. He purchased all the pig iron that he could possibly carry and sold it a few months later at great profit, winning a comfortable for-

tune in this single transaction. From that time on as banker and insurance agent he steadily prospered.

Peter White was a member of the Michigan legislature in 1857 and of the senate in 1875, on both occasions being sent to defend the interests of the upper peninsula in railways and other important legislation. Four years after the town of Marquette was incorporated he was unanimously elected mayor, probably constituting the only instance on record where a man obtained a mayoralty without a single dissenting vote; but this office he declined.

In 1872 he gave public expression to his friendship for Samuel P. Ely, who was elected mayor of Marquette during that year, by building a small library and dedicating it to the city. He presented it with 10,000 volumes from his own private library. This library he intended to be commemorative of Mr. Ely's administration. Thirty years later he gave to the city of Marquette one of the most splendid library structures in the country. His own private library is remarkable for its wide character as well as for the unusual number of first editions of rare books. He became an inveterate collector of rare publications and was indefatigable in the search for rare first editions. Nothing daunted him in this respect, many of the volumes in his library costing over \$1,000 each. The love of beautiful books was merely a reflection of the innate and inbred refinement of his nature.

Peter White had six children, only one of whom is now living, Mrs. George Shiras III, of Pittsburg. In memory of his son Morgan he built the Morgan Memorial Chapel adjoining St. Paul's Cathedral in Marquette. This building has never been consecrated as it was his wish that it should be available at all times for the use of the guilds for entertainments.

His most distinguished service to Marquette was the conversion of Presque Isle into a park. It was through his personal persuasion that the United States senate turned the land over to the city for park purposes. When the city demurred at the expense of maintaining it he improved it himself and maintained it for five years out of his own pocket.

There is scarcely a thing about Marquette that does not show the handiwork of Peter White—and Marquette is one of the best groomed and loveliest little cities on the American continent, favored not alone by natural beauty but by a better class of men and women than are to be found in an ordinary city.

He served as president of the Sault Ste. Marie Semi-Centennial Commission three years ago and made a speech in which he detailed practically the entire

commercial history of the upper peninsula of Michigan.

His wife died in the spring of 1905, since which time his home has been presided over by his granddaughter, Miss Joplin.

No man had a wider acquaintanceship than Peter White; and no man has lived a busier and a better life. He gave freely of his fortune and of himself to every worthy enterprise. He had naturally developed along generous lines. He was a citizen of the world and wherever he was placed he was at ease and at home.

WIRELESS TELEGRAPH ON CITY OF CLEVELAND.

The initial trip of the new steamer City of Cleveland was to Sault Ste. Marie, carrying the members of the Detroit Board of Commerce. The great steamer attracted much attention all along the route, visiting nearly all of the harbors in which it was possible for her to get. The busiest place aboard the boat on the trip was the wireless telegraph room of the Clark Wireless Telegraph System. The steamer carried 500 of the leading business men of Detroit who were naturally anxious to keep in touch with the market. The operating room was under the direct charge of Thomas E. Clark, manager of the company, and over 400 messages were transmitted, exclusive of about 8,000 words of newspaper reports. The company was able to keep in communication with the Detroit office for a distance of over 200 miles after which the messages were relayed at Port Huron. The service was practically instantaneous and created widespread interest among the business men, the great majority of whom had never had an opportunity before to witness a demonstration of this extraordinary means of communication.

The steamer Howard M. Hanna Jr., which was built at the Cleveland yard of the American Ship Building Co., made her maiden trip to Toledo on Saturday last. Capt. W. C. Richardson and a party of friends went on her.

The Breakwater Construction & Engineering Co., successors to Hughes Bros. & Bangs, of Cleveland, has practically completed its work upon the breakwater entrance at Ashtabula.

The Union Trust Co., of Detroit, is offering to investors \$150,000 of first mortgage steamship bonds on the steamer Adam E. Cornelius, which was recently completed at the St. Clair yard of the Great Lakes Engineering Works.

Work has been resumed on the Rock of Ages light on Lake Superior. Everything was found intact after the severe winter.

COMMERCE OF LAKE SUPERIOR.

Herewith is presented the summary of the commerce of Lake Superior to June 1, 1908. It shows a movement

Interstate bridge—One long, one short and one long whistle.

Wisconsin draw, Northern Pacific bridge—Two long and two short. Minnesota draw, Northern Pacific

bridge—One long and two short.

Grassy Point bridge—Two short and one long.

Lambourn avenue bridge—Three short.

Aerial bridge—Three long.

All except the last named are draw bridges and will be opened upon the proper signal being given by an approaching vessel.

The signal to the Aerial bridge is a cautionary one and should be given at a good distance from it.

MOVEMENT OF PRINCIPAL ITEMS OF FREIGHT TO AND FROM LAKE SUPERIOR.

Items	To June 1, 1908.	To June 1, 1907.	To June 1, 1906.
Coal, anthracite, net tons.....	145,081	279,771	101,454
Coal, bituminous, net tons.....	308,088	1,812,507	1,111,233
Iron ore, net tons.....	263,882	5,796,767	5,176,649
Wheat, bushels.....	16,783,020	20,686,212	17,335,905
Flour, barrels.....	679,577	919,685	1,002,400

REPORT OF FREIGHT AND PASSENGER TRAFFIC TO AND FROM LAKE SUPERIOR, FROM OPENING OF NAVIGATION TO JUNE 1 OF EACH YEAR FOR THREE YEARS PAST.

EAST BOUND.

Items	To June 1, 1908.	To June 1, 1907.	To June 1, 1906.
Copper, net tons.....	14,264	14,872	23,089
Grain, other than wheat, bushels.....	5,366,534	9,123,765	13,072,710
Building stone, net tons.....	679,577	919,685	1,002,210
Flour, barrels.....	263,882	5,496,767	5,176,649
Iron ore, net tons.....	2,964	1,725	1,821
Iron, pig, net tons.....	38,954	103,856	150,67
Lumber, M. ft. B. M.....	16,783,020	20,686,212	17,335,905
Silver ore, net tons.....	10,237	8,219	33,325
Wheat, bushels.....	1,053	603	1,578
Unclassified freight, net tons.....			
Passengers, number.....			

WEST BOUND.

Items	To June 1, 1908.	To June 1, 1907.	To June 1, 1906.
Coal, anthracite, net tons.....	145,061	279,771	101,954
Coal, bituminous, net tons.....	308,088	1,812,507	1,111,203
Flour, barrels.....	700		
Grain, bushels.....	47,856	50,576	68,315
Manufactured iron, net tons.....	163,534	113,206	80,553
Salt, barrels.....	93,486	147,731	171,791
Unclassified freight, net tons.....	1,325	996	2,161
Passengers, number.....			

SUMMARY OF TOTAL FREIGHT MOVEMENT IN TONS.

	To June 1, 1908.	To June 1, 1907.	To June 1, 1906.
East bound freight of all kinds, net tons.....	1,049,313	6,415,479	6,387,159
West bound freight of all kinds, net tons.....	618,829	2,307,398	1,461,386
Total freight, net tons.....	1,668,142	8,922,877	7,852,545

Total number of vessel passages to June 1, 1908, was 1,343, and the registered tonnage, 1,377,752.

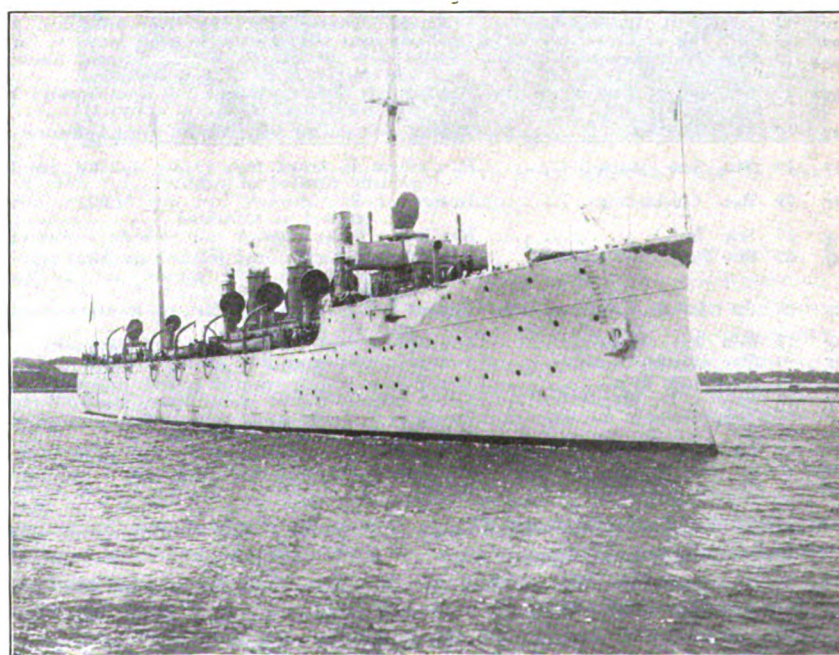
of 1,668,142 tons against 8,922,877 tons for the corresponding period last year, a decrease of 7,254,735 tons. The total commerce during May was 1,033,116 tons.

SAWDOLET FLOORING.

C. Clemente, 1732 Oregon avenue, Cleveland, manufacturer of Sawdolet, has installed this excellent flooring recently upon the bulk freighters A. E. Nettleton, W. H. Wolff and John A. Donaldson, as well as upon the new passenger steamer Americana, running on the Crystal Beach route. Mr. Clemente has made many improvements in the color and texture of this flooring recently and it is giving satisfaction wherever applied. It is adaptable to all forms of structures and can be applied to a steel deck readily.

SIGNALS FOR BRIDGES.

Major Graham D. Fitch has given orders for the use of the following signals for bridges on Duluth-Superior harbor. When approaching any of the bridges all vessels must give:



SCOUT CRUISER SALEM.

This cruiser made a maximum speed of 25.9 knots over the measured mile.

Her mean speed was 25.73 knots.

The Zenith Dredge Co., of Duluth, has completed the work of dredging in Portage river where the steamer John Stanton recently grounded. Among the obstructions removed was the lost anchor of the steamer Orinoco.

Accidents to Lake Vessels

Appended herewith is a list of the accidents which have occurred on the great lakes since the first of the year. Considering the extreme dullness of the present season, it is surprising to learn that 49 of the limited number of boats which have been in commission up to the present time have met with accidents. In the majority of cases the trouble was caused by grounding or the vessels striking obstructions. While there have been no total losses, one or two boats have been se-

riously damaged. The steamer Joshua W. Rhodes, which ran ashore in a heavy fog in Hammonds bay, Lake Huron, on May 22, is probably the heaviest loss so far. The Rhodes was carrying coal to Milwaukee when she went on, and 600 tons of her cargo had to be lightered before she was released. She leaked badly and was taken to Cleveland for repairs. The steamer is now in dry dock with 43 damaged plates and other injuries, which it will take three or more weeks to repair. Other mishaps were the

sinking of the little schooner R. H. Becker on Lake Michigan, near Sheboygan, the collision between the Canadian ice crusher Montcalm and the steamer Milwaukee, near Dunkirk, Lake Erie, the grounding of the barge Moravia in the Sault river, the grounding of the steamer John Stanton in the Portage river, the stranding of the steamer Sam Mitchell and her tow, the Chickamauga, on Lake Superior, and the grounding of the barge Warriner in the Cuyahoga river at Cleveland.

ACCIDENTS TO LAKE VESSELS SINCE JAN. 1, 1908.

DATE.	NAME OF VESSEL.	NATURE OF ACCIDENT.	PLACE.
Jan. 4	Tug. Geo. R. Hand.....	Burned; total loss; stripped of machinery.....	Ecorse ship yard.
Jan. 5	Car Ferry Manistique.....	Struck rock near breakwater; sank; floated Jan. 9 and was docked for repairs.....	Manistique, Mich.
Jan. 9	Str. George C. Howe.....	Sea-cock burst; sank in shallow water.....	Kingston, Ont.
Jan. 10	Str. New York.....	Caught fire; after-cabins and lifeboats and after-deck destroyed. Repaired.....	Algonac, Mich.
March 25	Car Ferry M. & B. No. 2....	Rammed by M. & B. No. 1; slightly injured.....	Lake Erie, near Conneaut.
March 25	Str. W. E. Reis.....	Caught fire; woodwork of galley considerably charred.....	Ecorse ship yard.
March 30	Bge. Lester.....	Sank.....	Detroit river.
April 7	Tug Lorena.....	Sank at dock.....	Sturgeon Bay, Wis.
April 9	Str. Harvey Brown.....	Sea-cock opened; sank while being loaded; pumped out.....	Ashtabula, O.
April 11	Str. City of St. Ignace.....	Swung into freighters tied up; several stanchions broken.....	Cleveland, O.
April 14	Str. Assiniboia.....	Hit by steamer Doric which broke from her moorings; slightly damaged.....	Owen Sound, Ont.
April 18	Str. Robert Wente.....	Struck bottom; steering gear broke and she crashed into a pier; several stanchions broken; pier badly damaged.....	Manistee harbor.
April 20	Str. Juno.....	Ran aground; pumped out and taken to Toledo for repairs.....	Pelée island, Lake Erie.
April 28	Sch. Carney.....	Ran on rocks.....	Alexandria bay.
April 28	Str. Puritan.....	Ran on sandbar; released, uninjured.....	Lake Michigan, near Holland.
April 29	Str. W. H. Gratiwick.....	Ran aground; released, uninjured.....	Portage lake.
April 29	Tug John Leatham.....	Struck rock; broke shoe and stern post.....	Near Green Bay.
May 1	Str. Oscoda.....	Got line in her wheel and struck dock; dock considerably damaged.....	Sturgeon Bay, Wis.
May 2	Str. S. C. Reynolds.....	Ran aground near Fighting Island.....	Detroit River.
May 5	Pass Str. Huronic.....	Crashed into Duncan's coal dock, damaging it considerably.....	Port Huron.
May 7	Sch. R. H. Becker.....	Became water-logged and capsized in gale; sank.....	Lake Michigan, near Sheboygan.
May 7	Str. Myron.....	Got tow-line in wheel while landing.....	Harbor Beach, Mich.
May 8	Sch. J. B. Newland.....	Hit breakwater; slightly damaged.....	Milwaukee, Wis.
May 9	Str. James H. Hoyt.....	Ran aground; released, uninjured.....	Lake Erie, near Dunkirk.
May 9	Ice Crusher Montcalm.....	Collided with Str. Milwaukee; sank.....	St. Lawrence river.
May 10	Bge. Moravia.....	Struck bottom; hole in starboard side; sank.....	Sault river.
May 10	Str. Utica.....	Ran aground; released after lightering.....	Lake Michigan.
May 11	Str. John Stanton.....	Ran aground; hole in side causing her to fill with water; docked for repairs.....	Portage river.
May 11	Str. J. T. Kopp.....	Stranded in Kinnickinnic river; delayed traffic.....	Milwaukee, Wis.
May 12	Str. Topeka.....	Stranded; released; slightly damaged.....	Big Point Sauble, Lake Michigan.
May 13	Str. I. W. Stephenson.....	Grounded; released after lightering; uninjured.....	Niagara river.
May 15	Str. Suit.....	Disabled; eight feet of water in hold; towed to port and pumped out.....	Lake Michigan.
May 19	Tug Wm. Kennedy.....	Collided with steamer G. Watson French; quadrant badly damaged; also port rail; repaired at Cleveland.....	Cuyahoga river, Cleveland.
May 19	Str. Harry Goulder.....	Crashed into bridge, damaging it considerably; hole in one of her bulwark plates.....	Lorain, O.
May 19	Str. Frontenac.....	Ran on rock during fog; released after lightering.....	Lake Michigan, near Sturgeon Bay, Wis.
May 19	Str. Sam Mitchell.....	Ran ashore in heavy fog; rudder disabled and hole in stern; temporarily repaired at Ashland.....	Lake Superior, near Houghton.
May 19	Bge. Chickamauga.....	In tow of Str. Mitchell; ran into Mitchell; stern of barge broken off; repaired at Cleveland.....	Lake Superior.
May 19	Sch. Nelson.....	Ran into a dock; bowsprit and jib-boom broken; repaired.....	St. Clair river.
May 22	Str. Joshua W. Rhodes.....	Ran ashore in heavy fog; released on 24th, after lightering 600 tons of coal; leaked badly; docked at Cleveland for repairs; 43 damaged plates.....	Hammond's Bay, Lake Huron.
May 22	Str. D. D. Calvin.....	Crashed into gates of lock No. 18, breaking three gates; steamer ran aground; leaked badly.....	Welland canal.
May 22	Sch. Mary Ludwig.....	Stranded in fog; released next day, uninjured.....	Whitefish point, Lake Superior.
May 24	Str. Mauch Chunk.....	Stranded; released on 24th after lightering; uninjured.....	Lake Huron, near Cheboygan.
May 24	Str. Black Rock.....	Struck draw bridge; released herself, uninjured.....	Chicago river.
May 29	Bge. S. D. Warriner.....	Struck bottom; rudder broke; leaked badly; docked for repairs.....	Cuyahoga river at Cleveland.
May 31	Tug Elizabeth G.....	Struck by Str. Thompson; side crushed; damage estimated at \$500.....	Sheboygan harbor.
June 5	Str. City of Montreal.....	Broke rudder chain and ran ashore.....	St. Lawrence river.
June 8	Tug Tom Dowling.....	Filled with water while lying at dock; cause unknown; sank.....	Ashland, Wis.
June 8	Str. Mataafa.....	Stranded on sand bar in heavy smoke.....	Off Indiana Harbor, Lake Michigan.
June 8	Fishing Tug Deer.....	Burned.....	Saginaw bay.

AROUND THE GREAT LAKES.

The Argo case, one of the most interesting marine cases, has been decided by the United States Court of Appeals at Chicago, affirming the decision of the lower court and holding the steamer Argo to be a constructive total loss. The case involved the right of the Graham

& Morton Transportation Co. to recover from the underwriters for a constructive total loss. The vessel went ashore Nov. 24, 1905, and was released Jan. 28, 1906, and taken to Manitowoc where she has since remained unrepaired.

The steamer Mataafa, which grounded two miles off Indiana harbor, Lake Mich-

igan, Monday morning, was released without damage after 300 tons of her cargo had been lightered.

No attempt will be made to utilize the hull of the burned steamer Glasgow, sunk in Sturgeon bay. The machinery has been removed in fairly good order, but the hull itself is beyond repair.

INTERNATIONAL WATERWAYS COMMISSION.

Ottawa, Ont., June 5.—A report by the International Waterways Commission was made to the Canadian parliament today. It deals with the effect on great lakes levels of the contemplated enlargement of the Chicago drainage canal; the preservation of the scenic beauty of Niagara Falls, and the exportation of power from Canada to the United States.

The American and Canadian sections of the commission are unanimous in their findings. They advise stringent limitations on the amount of water which may be diverted by the Chicago canal and the amount to be diverted to power purposes at Niagara.

10,000 FT. CHICAGO LIMIT.

In reference to the Chicago drainage canal the joint commission recommends that the government of the United States prohibit the diversion of more than 10,000 cu. ft. of water per second for the canal, that amount being considered sufficient for the sanitary purposes of the city for all times and providing for the largest navigable waterway from Lake Michigan to the Mississippi river, which has been considered by congress.

The amount by which the mean level will be lowered by the discharge of 10,000 cu. ft. through the canal is estimated at about 6 in. in Lakes Huron and Michigan, and about 5 in. in Lake Erie, and 4 in. in Lake Ontario.

Any further diversion, the commissioners say, would mean the expenditure of a large amount of money to restore depth in both American and Canadian harbors, and to maintain a uniform draught of 14 ft. in the Canadian canal system.

LIMIT POWER AT NIAGARA.

With respect to the proposal to erect a dam or dams in the Niagara river with a view to maintaining the level of Lake Erie, the commission has agreed that no works would be authorized which would lower the levels in Lake Ontario or the St. Lawrence river.

The commissioners make some important recommendations with regard to the question of power development at Niagara Falls and restriction of the amount of water to be taken on both sides of the falls by the various power companies.

After briefly reviewing the history of the agitation to preserve the scenic effects of the falls, and noting that so far only two companies in New York state and three on the Canadian side of the river have actually constructed works, the commissioners refer to the other proposed power development schemes on each side of the river, for which charters have been granted, under which water in unlimited quantities could have been taken at points above the falls. All these proposed developments, the commissioners say, would

affect more or less seriously the level of Lake Erie and all are objectionable.

CONCLUSIONS OF COMMISSION.

The commission reached the following conclusions:

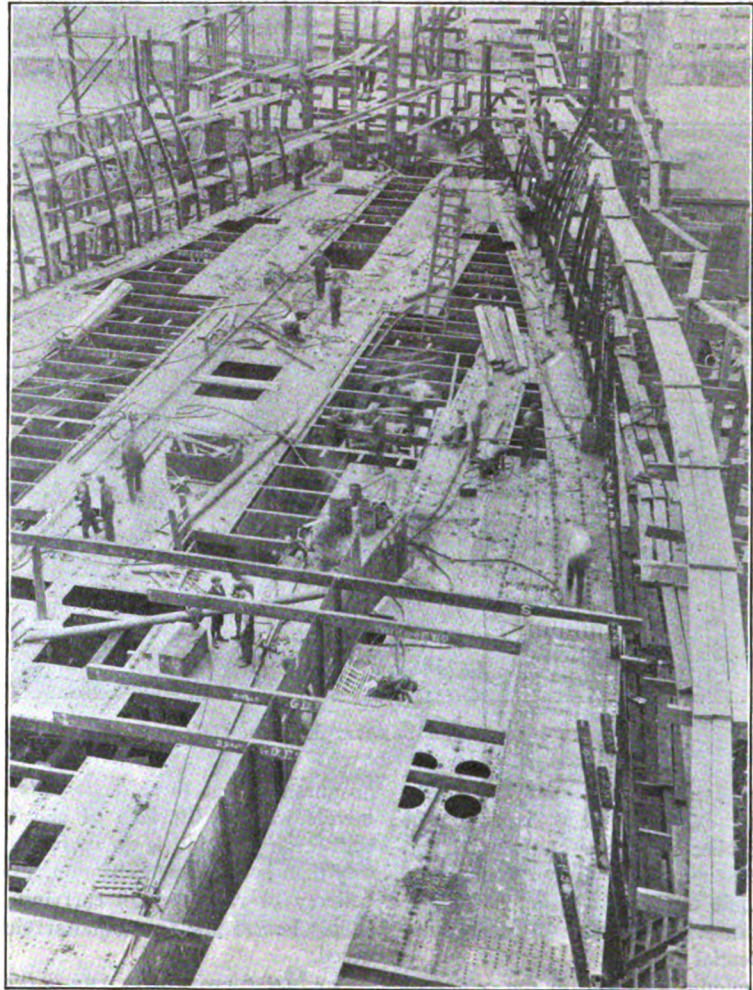
First—That it would be a sacrilege to destroy the scenic effect of the Niagara Falls.

Second—More than 36,000 cu. ft. per second on the Canadian side of the Niag-

all streams which flow across the boundary.

SENATOR GALLINGER ON THE OCEAN MAIL BILL.

Senator Gallinger, who conducted the fight for the passage of the ocean mail bill, which he succeeded in making a portion of the post office appropriation bill, but which subsequently was defeated



BATTLESHIP NORTH DAKOTA, BUILDING AT FORE RIVER, SHOWING HER 35.7 PER CENT COMPLETED.

ara river and 18,500 cu. ft. per second on the United States side, including diversion for power purposes on the Erie canal, cannot be diverted without injury to Niagara Falls as a whole. The commission, therefore, recommends that the diversion of water be limited to these amounts respectively, and in addition thereto a diversion for sanitary purposes not to exceed 10,000 cu. ft. per second be authorized for the Chicago drainage canal.

The Canadian section, while assenting to these conclusions, did so upon the understanding that any treaty on that basis should be limited to the term of 20 years and should establish a principle applicable to all diversions or uses of water adjacent to the international boundary and of

in the conference committee, has not given up hope for this legislation.

He predicted that at the next session of this congress the proposition would be agreed to. Analyzing the recent vote in the house and the growth of sentiment favorable to the subsidy plan Mr. Gallinger said:

"The ocean mail bill, which passed the senate on March 20, without a division, and later was sustained by the senate in the post office appropriation bill, on a vote of 46 to 12, is not killed by the action of the house in failing to accept it on a narrow vote of 145 to 153. Friends of the bill believe that next December it will win by a decisive majority. The exultation which the temporary defeat of this measure has aroused in Liverpool,

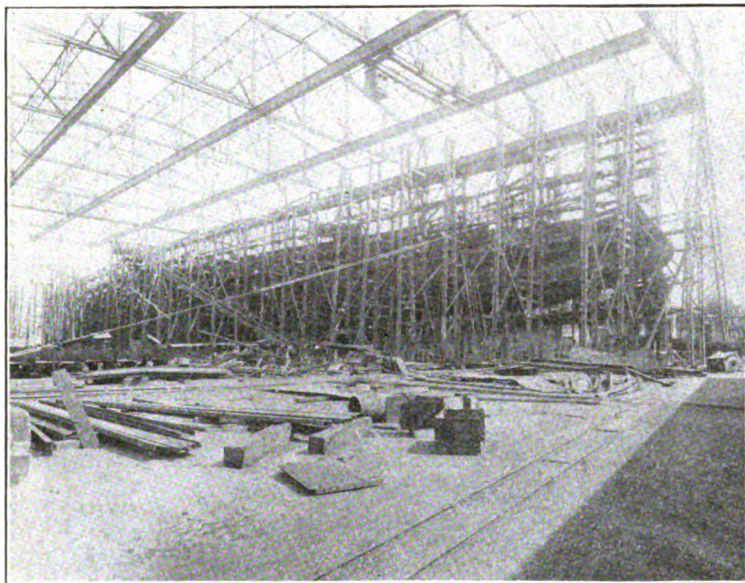
London and Hamburg, among the foreign ship owners and merchants is hasty and premature.

"The vote on May 23 shows how swiftly the ocean mail service and the merchant marine are gathering strength in the house of representatives. One year ago, 56 Republicans, nearly all from the middle west, voted against a bill for mail lines to South America. The other day only 36 Republicans, all of whom, except Mr. Perkins, of Rochester, N. Y., are from the middle west, voted against a bill for mail lines to South

measure of more than 2 to 1. Indiana gave only two Republican votes against the bill, while Illinois gave a majority of its votes for it, and the prairie state of Nebraska three out of five.

"These are figures which point unmistakably to an early and complete victory for the American flag. I have reason to believe that many—probably a majority—of the 35 western representatives who voted against the ocean mail bill a week ago personally favor legislation of this kind, but fear it is not yet properly understood by their constituents. There is

the assurance to assail the ocean mail bill as in the interest of 'monopoly'—though the bill has no more earnest champions than President Roosevelt and Secretary Taft. This is a measure in the interests of the safety and independence of America and the freedom of the seas. As before suggested, I am confident that before the Sixtieth congress adjourns the ocean mail bill will have won sufficient new support in the middle west to insure its final passage by a strong majority in the house of representatives."



BROADSIDE VIEW OF NORTH DAKOTA, 35.7 PER CENT COMPLETED.

America, Japan, China, the Philippines and Australia. A year ago 22 per cent of the Republicans of the house were opposed; this year only 16 per cent. And this second test is all the more significant because it was made in the year of a presidential election.

"The middle west is still the center of opposition, but that opposition is a waning one. Already there is much more support than hostility in those inland states which have long been the special field of activity of the European steamship corporations. For 40 years the agents and attorneys in this country of foreign ship trusts, like that which took several fast steamers out of New York in our war with Spain and sold them to the Spanish government, have been boasting that the whole middle west was unalterably opposed to all national legislation for an American ocean mail service and merchant marine.

"Now, as a matter of fact, the inland States between Ohio and the Rocky mountains cast 88 Republican votes for the ocean mail bill in the house the other day, as compared with 35 votes against it—a middle western majority for this

no question that there is hostility in the middle west to the idea of subsidy, but this ocean mail bill is no more of a subsidy than is our expenditure on rural free delivery or railway mail carrying. It is simply honest pay for actual service rendered.

FOREIGN CORPORATIONS THE GAINERS.

"Western misunderstanding of the ocean mail legislation, wherever it exists, I am convinced, is due in large part to the propaganda maintained for many years by the rich and powerful European steamship combinations through their emigrant agencies scattered all over the western country. These foreign ship companies are afraid of a vigorous, competing American merchant marine. They now monopolize 9/10 of our ocean carrying, and receive for this more than \$200,000,000 a year. Because there are no American ships, these foreign concerns are able to force the United States government to pay double transit rates for the privilege of sending our mails to South America via Europe, and they are scheming now to drive our flag off the trade routes in the Pacific ocean.

"It is these alien monopolists who have

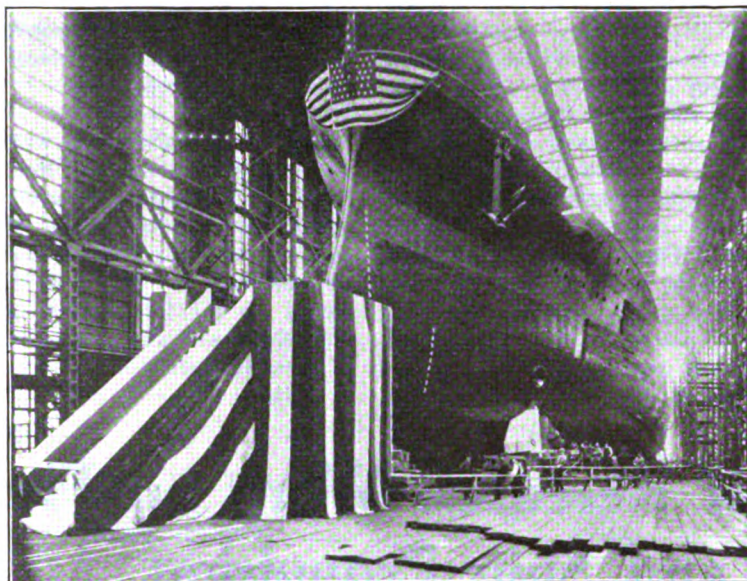
THE WELIN QUADRANT DAVIT.

The steamship Rotterdam, the latest addition to the fleet of the Holland-American Line, will sail on her maiden trip from Rotterdam on June 13, leaving New York on July 1 on her return voyage. The Rotterdam is 668 ft. long, 77 ft. beam, and 48 ft. deep. She is of 24,170 tons register and 37,190 tons displacement and on her official trials maintained a speed of 18 knots. A model of the Rotterdam is being exhibited in the window of a store at the corner of Broadway and 25th street, New York City, the model being about 10 ft. in length and complete to the most minute detail. It is interesting to note that the Rotterdam is equipped throughout with Welin Quadrant Davits, no less than 18 sets of working davits being part of the fittings of the model.

The steamship Chicago of the Compagnie Generale Transatlantique, which arrived at New York this week on her maiden voyage, also has a complete equipment of Welin Quadrant Davits, the rapidly increasing demand for this up-to-date lifeboat equipment showing a desire on the part of the shipping companies to have the best that pertains to the safety of the passengers and crews aboard their vessels.

Pickands, Mather & Co.'s new fuel plant at Detour is completed and ready for business. The new dock has 10 pockets and is equipped with all of the latest mechanical appliances. As there is no current at the point where the dock is located, steamers may moor head up or down as is most convenient. W. L. Sherwood is in charge of the plant.

The steamer David B. Meacham, building at the Ecorse yard of the Great Lakes Engineering Works for the Frontier Steamship Co., North Tonawanda, N. Y., will be launched at noon on June 25. Miss Elizabeth Kennedy, of Pittsburgh, will be sponsor for the new vessel.



THE BATTLESHIP MICHIGAN ON THE WAYS AT THE NEW YORK SHIP BUILDING CO.'S PLANT.

ATLANTIC COAST GOSSIP.

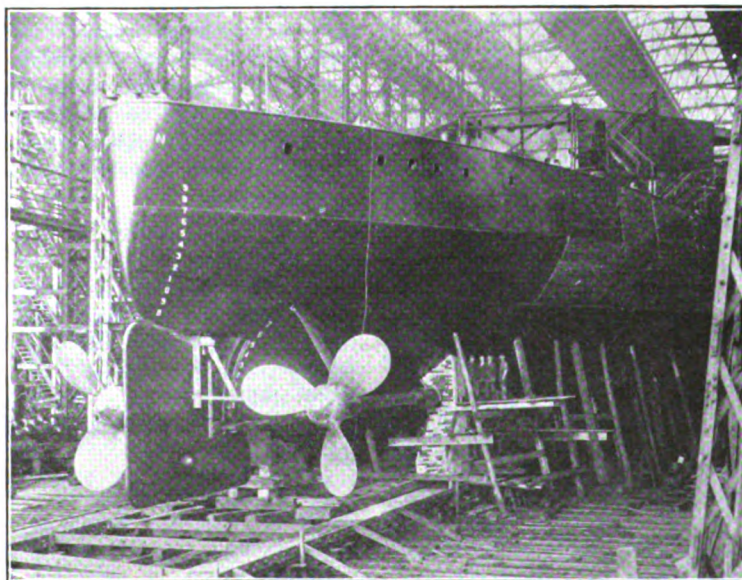
Office of the MARINE REVIEW,
Room 1005, No. 90 West St.,
New York City.

A salvage fee of \$1,000 will be paid by the war department to the owners of the steamship *Vincentica*, which rescued the disabled government launch *Chicago* from a dangerous reef, badly damaged, and towed her to Manila. The *Chicago*, which cost the government about \$8,300 when purchased in 1899, had broken her shaft and was ashore on a reef.

The Hamburg-American liner *Arcadia* has left Hamburg for Philadelphia direct with a large cargo, this being the first direct sailing to Philadelphia in six months. The other steamers of the line discharge part of the cargo at New York, proceeding later to Philadelphia, all the loading



GOVERNOR WARNER AND PARTY AT THE LAUNCHING OF THE BATTLESHIP MICHIGAN



STERN VIEW OF BATTLESHIP MICHIGAN JUST PRIOR TO LAUNCHING.

outward being done at the latter port.

Announcement is made by the United Fruit Co. that it will shortly inaugurate a fortnightly service between New York and Puerto Barrios, Guatemala, and Bocas del Toro, Colombia. The service between Charleston and Jamaica will be discontinued and an increase will be made in the service between other ports and Jamaica.

The British bark *Drumelton* arrived at Philadelphia last week with a cargo of sugar, making the passage from Cheribon via St. Helena in 162 days. She had experienced nothing but calms, and had drifted the greater part of her passage of over 15,000 miles.

The armored cruiser *Brooklyn* is to undergo extensive repairs at the

League Island navy yard, and it will probably be a year before the repairs are completed. She has been in reserve at the yard for several months.

The armored cruiser *North Carolina* has broken coaling records at the naval coaling station at Bradford, R. I., by taking on board 487 tons of coal in three hours. This included the time taken in rigging the coaling gear.

Work of construction on the next 20,000-ton battleship, to be built at the New York navy yard, will commence in the near future.

A bronze memorial tablet to Abraham Lincoln, presented to the Hamburg-American liner *President Lincoln* by the Grand Army of the Republic, was unveiled on board the ves-

sel, lying at her pier in Hoboken, on the afternoon of June 5. The tablet, upon which is engraved Lincoln's Gettysburg address, is installed at the head of the main companionway of the upper promenade deck.

At a conference recently held between Assistant Secretary Reynolds, representing the treasury department; Colonel E. S. Fowler, collector of the port, and General James S. Clarkson, surveyor of the port, plans were formulated for a stringent enforcement of the steamboat inspection law. Rigid

measures will be taken to prevent overcrowding on any steamboat in New York harbor and vicinity during the present season. The treasury department will spare no energy or expense to enforce the law.

Barges Nos. 18 and 20 were launched at the Brooklyn navy yard on Tuesday. These barges, which cost \$40,000 each, will be used in New York harbor for carrying coal and water to vessels of the government. Each has a capacity of 450 tons, and is propelled by twin screws. The

barges were christened by the Misses Eleanor and Esther Gregory, twin sisters, of 13 years, the daughters of Luther E. Gregory, C. E.

The steam yacht Viva, which went on the shoals on the New Jersey coast while trying to get into Alsecon inlet Saturday night, has been pounded to pieces by the waves and is a total wreck. She was formerly owned by the late Mayor Grace, of New York, and was to have been used in carrying excursionists this summer at Atlantic City.

A New Method of Research Work on Fluid Resistance and Ship Propulsion*

BY HERR H. WELLENKAMP, MEMBER.

Before entering upon the real subject of this paper, I should like to refer to the principal points of the paper I read in Berlin in November, 1907, before the Schiffbautechnische Gesellschaft, as I presume that the method I am about to describe is unfamiliar to most of you. On that occasion I described the principles of a new method of towing ship models, and gave the results of experiments in the imperial dockyard at Kiel. The subject that is to be brought to your notice today concerns another step forward in this method of testing ship models. The towing of ship models alone does not suffice, as is well known, to solve the problems which confront ship builders. What we undoubtedly need much more urgently is a trustworthy, simple, and speedy method of investigating the effect of screw propulsion on models, and it is on this account especially that the new method will be found advantageous.

I cannot help remarking here that it was Sir William White who first induced me to deal with experimental tank problems by his valuable paper of 1904 on "The Establishment of an Experimental Tank for Research Work on Fluid Resistance and Ship Propulsion." The arguments in favor of a tank specially devoted to such purposes could not have been presented in a more conclusive manner than was done in that paper, and in the discussion that followed it. It was there stated, and fully admitted, that a demand exists for a ready means of carrying on investigations concerning

towing resistance, and of extending our knowledge of frictional and air resistance, and especially of improving upon the hitherto unsatisfactory experience with regard to screw propulsion, which is liable to inaccuracy arising from the smallness of scale. Although at the time of Sir William White's paper there was, of course, a general belief in the merits of the system, which we owe to the genius and the mechanical skill of the late Mr. Wm. Froude and his son Mr. R. E. Froude, there seemed to be little hope of obtaining information of practical value as to the quantitative results of experiments.

In endeavoring to contribute as much as possible to the solution of the problem, and in order to meet these requirements, I have devised a method of overcoming at the same time the financial difficulties of tank experiments by introducing greater simplicity and enabling a shorter tank to be used; and also of avoiding the various difficulties arising from the use of delicate mechanism, which is said to be not always quite reliable and trustworthy. It was an almost imperative necessity to do away with the carriage, the rails, and the mechanical tractive power, and to employ a system of motion that would be purely self-acting, self-regulating, and self-registering. My method is, within certain limits, identical with earlier methods, especially with that which Beaufoy so effectually applied in the Greenland docks at the end of the eighteenth century. When I recently became acquainted with Beaufoy's experiments, I was very much surprised

to find how near he was to a complete solution of the problem. Nevertheless, it must be admitted that his system was in embryo, and it is remarkable that he was able to obtain any results at all. Certain it is, however, having regard to the great difficulties arising from his system of motion and measurement, that Froude's towing method would never have been adopted if Beaufoy's system had not failed.

The chief consideration in dealing with towing experiments is that models should follow a direct course straight forward, totally free from deviations and disturbances, with a uniform motion and, as far as possible, with a constant velocity. This uniform motion is very difficult to attain in practice. For instance, a carriage on absolutely even rails, and fitted with the best type of wheels and bearings, will move at a speed which to the eye, perhaps, appears quite uniform, but the finest measuring instruments will show that there really are disturbances due to irregularities in the working mechanism employed, or to differences between towing force and resistance.

There are, however, to all intents and purposes, perfectly regular motions produced by nature alone, in which man has no hand, such as, for instance, the motion of a rain drop falling freely through still air, or of a body sinking in water, assuming that the shape of the body is suited to this motion.

It is obvious that the resistance which a ship or a model meets with when gliding through the water at a constant speed is perfectly constant

*Read at Institution of Naval Architects.

also. In this case it depends only on the kind of tractive power whether we attain a thoroughly uniform motion, as desired, or not. Nature herself gives us such a tractive power in the force of gravity. If we apply this force and take away all gear we may be sure that the motion becomes as uniform as possible. Nevertheless, there are still some very small irregularities such as occur throughout na-

from previous experiments can be considered absolutely reliable.

I will now proceed to give a description of the towing arrangements which are shown in Fig. 1 (Plate I).

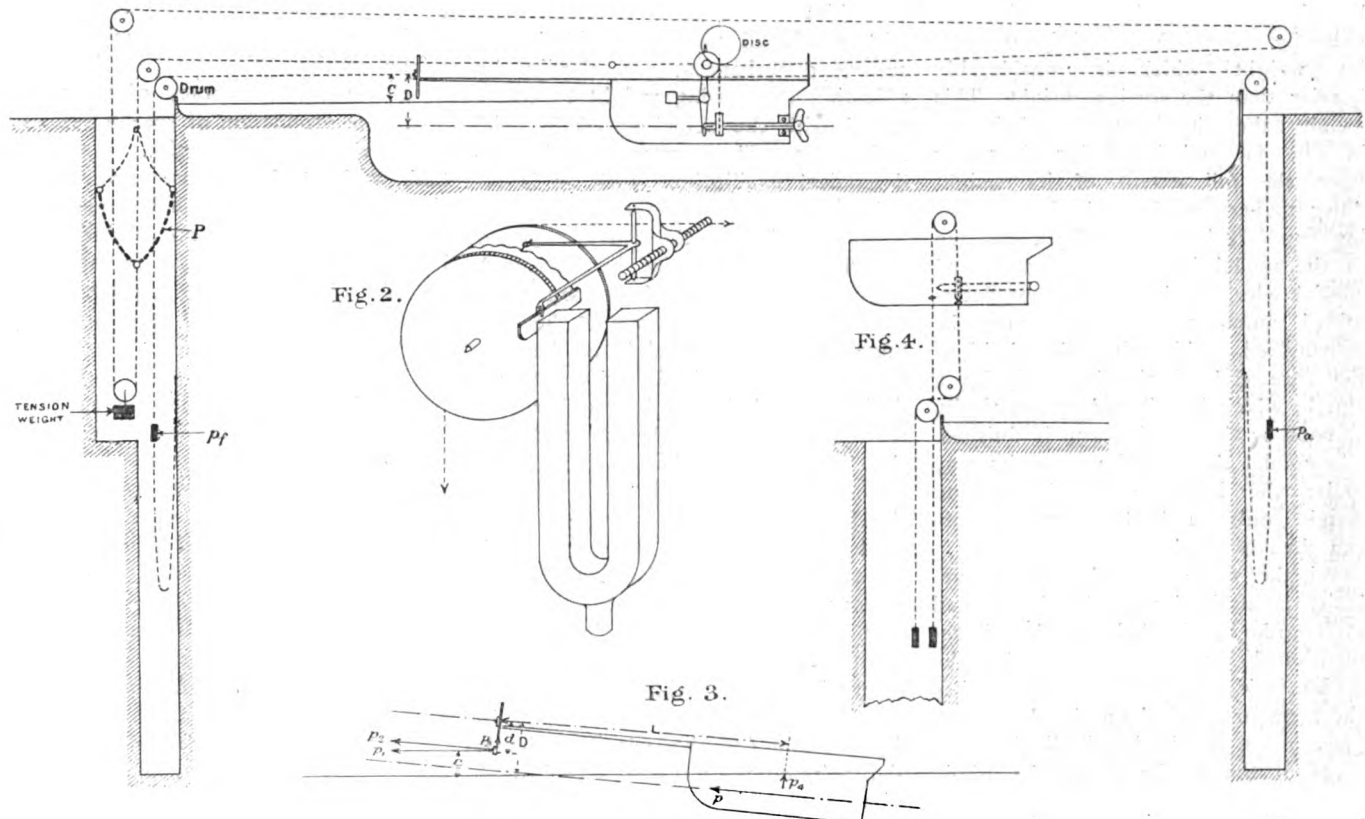
A very thin piano wire is attached to the end of the long bowsprit of the model, and is stretched horizontally above the water to the end of the tank, where it passes over a drum into a deep well. This drum has extreme-

vent the overlapping of the wavy line, a longitudinal movement is imparted to the needle point.

That constitutes the whole apparatus employed during the measuring run.

Let us now suppose that an experiment is to be made on a model under the tractive force of the towing weight alone (p_f) alone. At starting, the whole power of the weight is employed in producing kinetic energy

Fig. 1.



NOTE THE VERTICAL SCALE FOR THE MODEL AS ILLUSTRATED IS EXAGGERATED FOR THE SAKE OF CLEARNESS.

ture, arising from the minute oscillations due to friction and eddy resistance. But it is impossible to measure these irregularities, which are scarcely perceptible by the finest vibrometers, and do not interfere at all with the results.

Further, if we apply a tractive power which is not only quite constant, but also exactly equal to the resistance of the model at the actual speed, we obtain not only a perfectly regular motion, but also an exactly constant velocity. This is the object which we are striving to attain. All attempts hitherto made with apparatus utilizing gravity as the tractive force have, as far as I am aware, been without satisfactory result, and it is doubtful whether the data obtained

ly fine agate-pointed bearings, and a polished surface which may be blackened with soot from a turpentine flame. The circumference of the drum is exactly 1 meter, and equal to one turn of the wire. The groove for the wire is on one side of the drum; and on the other side a scale is engraved. (Fig. 2.)

A towing weight hangs at the end of the wire in the well. This weight is rather small, because the resistance of a model at the highest speed attained is generally less than 1 per cent of the weight of the model. A time recorder consisting of a big tuning fork, records by means of a needle point, one-hundredth parts of a second in the form of a wavy line on the revolving surface of the drum. To pre-

and imparting it to the mass of the model, the wire, the drum, and the weight. As soon as any velocity is attained, resistance of the water is produced, and must be overcome by a corresponding portion of the power of the weight, thus leaving the remainder of the power available for further acceleration. This remainder will continually diminish and will finally disappear altogether, while the resistance increases correspondingly and becomes at last just equal to the whole of the towing weight, leaving nothing for further acceleration. From this moment the starting run, i. e., the period of acceleration, is finished, and the measuring run, i. e., the period of dynamical equilibrium, now begins. In order to realize what a very long tank

would be necessary to attain dynamical equilibrium, if using only the towing weight, it must be remembered that even if resistance did not absorb power at all, and the whole of the towing weight were to produce energy, there would be required a starting run of at least 50 meters in length, for models of usual size and speed. But if resistance comes into play, this run must be four or five times as long before the velocity can become approximately uniform.

There is a simple way of reducing the starting run down to a few meters by giving the model an initial impulse by means of an additional starting weight, which is considerably heavier than the towing weight. This weight takes the form of a chain (P, in Fig. 1), and its action decreases from the full extent of its weight down to zero at the end of the starting run. It is temporarily connected to the model by means of a second special wire, so that various predetermined amounts of power may be transmitted. This wire takes hold of the fore end of the bowsprit by a clutch, which is released automatically as soon as the starting run is finished. The model then continues on its way under the influence of the towing weight only, and the measurements can then be made.

Whether or not a really constant velocity is attained must be determined afterwards by the help of the above-mentioned wavy line traced by the tuning fork. Since the wavy line takes the form of a spiral on the drum surface, owing to the longitudinal movement of the needle point, the whole measuring run is represented for every hundredth part of a second to full size. This enables us afterwards to ascertain whether the velocity has been constant or not, and to measure its amount. Should it be found that there has been acceleration or retardation, $\pm \gamma$, it shows that the towing weight was either too large or too small. It follows that the (mass of the model $\times \gamma$) is the weight necessary for correction. After the towing weight has been altered by adding to or subtracting from it, the experiment must be repeated, and we then shall obtain a run with a uniform, or substantially uniform, speed due to the adjusted towing weight.

It must be remembered here that the heavy starting weight has to be accurately adjusted in order that the same energy may be transmitted to the mass when repeating the experiment, otherwise it would be impossible to attain the same velocity as before,

and the repetition of the run would be a failure. If the second run does not yield a sufficiently constant speed, there is no difficulty in again determining the correction for the towing weight, and then making a third run, and so on. It will be seen that the method is thoroughly adapted to the most delicate scientific research work, by enabling us to advance gradually to the highest degree of uniformity of motion.

This result is attained, firstly, by means of the exclusive use of gravity, as the most uniform towing power available; secondly, by doing away with nearly all apparatus, with its resulting disturbances; and thirdly, by adjusting the towing weight to correspond with the actual speed by trial and error. The consequence is real dynamical equilibrium, such as is required for an exact investigation.

After each run the tractive power and the velocity must be measured. The former is accurately known up to 1/10,000 kg., for it consists of the towing weight and the weight of the connecting wire. This is kept constant during the whole run by another supplementary wire or thread of double the linear weight, hanging from the upper part of the well in a bight to the lower end of the towing weight.

The velocity of the model is recorded on the drum surface, where the waves are given for each hundredth part of a second to full scale. It is of great value for accuracy of measurement that neither the curve of time nor the curve of velocities has to be drawn. We find the velocities clearly shown by cross curves passing through adjacent waves. In order to attain greater accuracy the wavy line is divided by a straight spiral line, and the crossing points of the two can be exactly determined.

Whether an experiment made as above indicated has been successful or not, i. e., whether the result has been disturbed or not by any outside influence, is seen by reference to the cross curve on the drum. This curve must be of a smooth character, free from irregularities.

If the cross curves appear as straight lines, then it follows that the velocity has been constant, but if they are concave or convex then it follows that the velocity has been accelerated or retarded. The slightest amount of such curvature is easily perceptible, and capable of measurement.

Another advantage is that when the curve of resistance of a model for various speeds has to be drawn, it is no longer necessary to have a great num-

ber of points, as is the present custom; a fifth or fourth part of the present number of runs is quite sufficient, no point being found very distant from the curve.

Although I have already said that it is generally necessary to make one or two preparatory experiments before dynamic equilibrium is reached, this is unnecessary if a set or series of experiments is made, beginning with low speeds and rising by small steps to high speeds. In this case each trial is a preparatory one for the next, and allows us to estimate almost accurately the increase of starting weight and towing weight for the following trial.

The method, therefore, enables us to obtain great accuracy of measurement, the production of speedy results, and a very great reduction of size of tank, without the necessity for a carriage or rails with their expensive foundations. Again, no engine gear is necessary, so that the initial cost, as well as the running expenses, are exceedingly small, and the management is very simple.

There are other advantages, some of which I will mention here. For instance, models on a larger scale can be employed than have been up till now, and the tank can be enlarged in breadth and depth without incurring great expense. Velocities may be increased without difficulty, far more than when using a heavy carriage with a large moment of inertia. Further, the process is open to the spectator, and is easy to follow, to control, and to photograph, all the more so because the apparatus need not be continuously watched or handled during the run, the results being automatically recorded, so that they can be inspected and measured when convenient. One single movement of a lever when starting the model is all that is required. It releases the model from the starting point, and makes the tuning fork sound either by the stroke of a hammer or by electromagnetic contact. All the movements are made automatically—viz., the release of the starting weight from the model, the tracing of the needle of the tuning fork on the drum surface, and its sideways movement to obtain a spiral wavy line, and, finally, the braking of the model by a special heavy weight which is seized and raised at the right moment.

One of the principal advantages is that the method can be employed not only for towing models and testing resistances, but for all sorts of tank experiments. Before giving examples of other experimental work, I will

discuss briefly certain objections that have been raised regarding the accuracy and the general applicability of the method.

It has been suggested that a motion of so short a period would not suffice to attain the dynamic equilibrium mentioned above, because the surrounding particles of water at some distance from the model are said to change their motion in a small degree after the model has attained uniform motion, so that these particles may alter the velocity of the model from behind to an appreciable extent; which means upsetting the equilibrium. But it is obvious that the motion of the model does not become constant until all the particles of water which can in any way influence the model have themselves reached a state of equilibrium, and the only question is, when does this moment arrive? Whether this state of affairs occurs or not, does not depend on any theoretical considerations, but is simply a statement of facts, depending entirely on the character of the cross curves. If they are really straight lines, there is no doubt that equilibrium has been reached. When they tried at Charlottenburg, by means of Woltmann's blades, to prove this suggested defect of too short a run and starting run, it was not observed that the apparent defects were attributable to the irregularities of the motion of the carriage and other defects.

I will now state as a result of my experience, and of the information obtained from diagrams obtained during the experiments at Kiel, that the lengths of the starting run and of the measuring run need not exceed $1\frac{1}{2}$ lengths of the model; the length of the tank ought to be $4\frac{1}{2}$ times the length of the longest model that is to be tested.

It has also been objected that the wire is attached to the bowsprit at too high a point, instead of at a point corresponding to the height of the propeller shafts. This is of no importance, as there is no difficulty whatever in eliminating this defect. We have only to consider that the towing power is accurately known, and the height of the wire above the propeller shafts as well; consequently, the trimming moment is also known. We therefore have only to trim the model before the trial begins, by displacing a small part of the weight of the model so as to counterbalance the trimming couple accurately, the model being then driven exactly as if by screws.

Another objection raised is that the

sagging of the wires causes a slight deviation of the towing force from the horizontal. To avoid this a small weight—it is really no more than $1/1,000$ of the tension of the wire—may be removed from the end of the bowsprit, thus neutralizing the small downward component of the towing force.

A further objection is as follows: Every ship is, while in motion, exposed to varying trimming forces resulting from the water pressure, which generally have a tendency to raise the bow (Fig. 3). Thus the point of attachment of the wire at the end of the long bowsprit will be raised to a perceptible degree, and the direction of the towing wire will no longer be horizontal, and will therefore produce a defective trimming moment, which does not exist when the ship or the model is driven by screws. Since the raising of the bow cannot be foretold, it is necessary to observe this effect during the trial and afterwards to neutralize it before the next trial begins. We have only to observe the lifting of the point of attachment and to lower it by about the same amount. There is a sliding piece in a vertical slide-way fitted at the end of the bowsprit, which enables one to lift or to lower the point of attachment. Thus the horizontal direction of the towing force is secured, and the model is again under the influence of the towing force and the trimming moment, in exactly the same manner as if it were being driven by screws.

SCREW PROPULSION.

The chief consideration in the towing method was the dynamic equilibrium automatically produced under the influence of gravity alone. There is no reason to depart from this leading feature when dealing with research work on screw propulsion.

I will now give the chief features of the arrangement which I at first employed and afterwards improved upon for general application.

I had a model with the same bowsprit, wire, drum, and weight as already used in the towing experiments, and I attached another wire at the aft end of the model, passing above the water surface over a pulley into another well at the aft end of the tank, where a weight (p_n) equal to the forward one, is suspended. In this way the model is no longer towed by a weight, but is in perfect statical equilibrium. If by some other means the model is put in motion, its progress is recorded as before on the drum surface. The model may be fitted with one or more

screws on propeller shafts just as in a ship, and may be driven by the action of the screws, i. e., by thrust. The screws must be revolved by the most uniform force available, i. e., by gravity. To obtain this we attach a third weight to the screw shaft by means of a very thin wire which is wound round the shaft as many times as there will be revolutions made during the whole run. The wire passes from the shaft vertically upwards over a guide pulley at the top of a mast on the model, and carries at its free end the third weight. This weight drives the model (not shown in the diagram) indirectly, by producing the force to revolve the screw, during its fall from the top of the mast.

The thrust produced depends upon the speed of rotation of the screw and upon the speed of the model. These both increase gradually while the model is exclusively under the influence of the falling weight. Assuming that there is a sufficiently long run, we may expect to reach at last a maximum number of revolutions, and consequently a corresponding maximum speed. The whole thrust then produced by the weight is absorbed in overcoming the total resistance of the model. This is not merely the towing resistance but also the "augment of resistance" (as Mr. Froude calls it) owing to the suction of the screw, sometimes called "thrust deduction." A condition of dynamic equilibrium having been attained, we may begin to measure: (1) the speed of the model, (2) the number of revolutions of the screw per second, (3) the work done by the sinking weight. There is still wanting only, fourthly, the thrust, which requires special apparatus for its measurement.

We have already seen that the moving force, or the thrust, acts on the model by means of the screw propeller in the same manner as in a ship. There is only one slight difference, viz., the shaft is not kept fixed by a thrust bearing, but passes through an almost frictionless ball bearing in the boss, which allows at the same time a longitudinal movement of the shaft within certain limits. The fore end of the shaft is sharpened to a point, which is hardened. This point presses against a cup-shaped agate-bearing placed in the short lever of a spring dynamometer, thereby moving it longitudinally to a small extent, say, $\frac{1}{8}$ in., or less, according to the magnitude of the thrust. By this small movement the thrust exerted can be measured, if another longer lever of the dynamometer is fitted with a pointer which records on a blackened

surface. The spring dynamometer may be adapted to measure forces between 0 and 1 kg.; we then have to fix an additional counterbalancing weight to a counterlever in order to be able to also measure greater thrusts with the same spring within the same limits of shaft movement, and with the same accuracy.

It is evident that the apparatus described cannot be employed when the model has to make a long run. The weight hanging down from the mast cannot exceed a definite amount because of the limited stability of the model. For practical purposes a longer run is often required, and consequently it would not always suffice for making exact and trustworthy measurements with the arrangement just described.

To fulfil this requirement another arrangement may be employed which is an improvement only in one respect, viz., by doing away with the third weight hanging down from the mast, and thus obtaining further simplification. The apparatus will then be as follows: The first weight is, as we know, attached to the wire at the bowsprit, and exerts a tension in the forward direction; the second weight is now used not merely to counterbalance the first one and to keep the model in statical equilibrium, but is at the same time used to rotate the screw. It is therefore fastened to the shaft of the screw instead of to the aft end of the model. Its wire is wound round the shaft as was previously done, and passes over a guide pulley on the deck of the model and is led horizontally to the pulley placed at the well at the aft end of the tank. There it is kept stretched by a weight of just the same magnitude as the corresponding one in the well at the fore end.

We now have the model, firstly in a state of statical equilibrium under the tension of the two wires fore and aft, which must both lie in one straight line to avoid a couple; secondly, under the moving influence of the aft weight, which is no longer fixed, as its wire can freely unwind, allowing it to fall in the well after being released. The screw shaft is thus revolved, and the model is driven forwards although the wire pulls backwards. This time the aft weight not only counterbalances, but is a moving one, and develops work.

Thus if

p_f = weight at fore end,

p_a = weight at aft end,

l = length of wire unwound during run,

l_f = distance traversed by driving weight,

l_a = distance traversed by falling weight,

then, the work done is $p_f \times l$, or $p_f (l_f + l_a)$, or, with reference to the equation of potential energies, $(p_f \times l_f) + (p_a \times l_a)$.

I need hardly mention that the means described for preventing small defects in the towing experiments must be applied as before. I refer to the means for eliminating the influence of the sagging of the horizontal wire, of its varying weight, of the trimming effect on the model, and chiefly to the use of a special starting weight to overcome the inertia of the mass of the model by producing virtual energy.

The measurement of the speed of the model is done in the manner already described by time-recording on the drum surface. The number of revolutions of the screw is recorded by a revolving disc moved at a slow rate by the guide pulley on the deck. On this disc, time in seconds is recorded by electrical means, and the thrust of the screw is recorded by the pointer of the dynamometer balance. This recording of time, thrust, and revolutions is done quite automatically. The two diagrams, the one on the drum surface, with hundredth parts of seconds, and the other on the disc with full seconds, can be combined very easily.

When starting experiments, we have to calculate as nearly as possible the probable value of the two suitable weights for the starting impulse and for driving the screw, and if the desired result is not attained, we have to change the weights in the same manner as described for the towing experiments, and thus any desired accuracy may be attained. But care must be taken that the weight for driving the screw is attached both at the fore and also at the aft wire, to ensure exact statical equilibrium.

In this apparatus only three pulleys or drums and the shaft bearings are under stress. The friction of these has to be overcome, and that requires a special experiment to determine the amount of friction at different speeds and weights. Without such a test the trials would be defective. In order to ascertain the friction, we take off the blades of the screw and join the two fixed ends of the wires instead of fastening them to the shaft and to the bowsprit. This single wire is then led over the same drum and the pulleys as in the trial, but somewhat differently arranged, as shown in Fig. 4, and the same weights are applied. The system is then put in motion by a small additional weight attached to one or other of the two weights at the ends of the wire. The speed attained is recorded, and the friction can

be calculated. Thus the results of screw propulsion are as accurate as may be desired, and are ready for the complete investigation of all questions connected with this kind of experimental work.

As mentioned above, there is no difficulty arising from the use of more than one propeller. Each of them may be driven by a special wire and weight, and each may also have its separate record of revolutions, thrust, and work. If desired, as will usually be the case, all wires can be kept at the same speed when led over one drum, instead of over separate pulleys, and any predetermined relative number of revolutions may be attained.

As to the experiments carried out up till now, I need only mention that there is a dry dock at the Imperial Dock Yard at Kiel, fitted as a provisional experimental tank, where most of these interesting points have been investigated. The research work carried out on some models of new ships has shown the great efficiency and the trustworthiness of the method.

In consideration of its superiority and applicability to all kinds of experimental work, the new tank built by the Hamburg government, as well as the new tank to be built for the German navy, are designed and will be installed on this new system.

I venture to hope that in this way a new field will be opened, as much for further practical information as also for the purpose of scientific progress in hydrodynamics.

STEAMER HONDURAS.

The Buffalo Dry Dock Co. recently launched the steamer Honduras for the Davidson Steamship Co. at Bay City. The Honduras is of Canadian canal dimensions, being 256 ft. 10 in. over all, 243 ft. keel, 43 ft. beam and 26 ft. deep. The machinery of the old steamer Panama is installed in her, the dimensions being 19, 30 and 52 in. cylinder diameters by 40-in. stroke, supplied with steam from two Scotch boilers, 11 ft. by 11 ft., equipped with Howden draft, two 39-in. furnaces, and allowed 160 lbs. pressure.

W. M. Mills, manager of the Tonawanda Iron & Steel Co., has made the following changes in his fleet: Capt. Alexander Johnson, of the steamer Fleetwood, becomes master of the new steamer James Corrigan; Capt. Charles Christie, of the steamer Packer, goes into the Fleetwood; and B. J. Gallagher, formerly mate of the Fleetwood, takes command of the steamer Packer.

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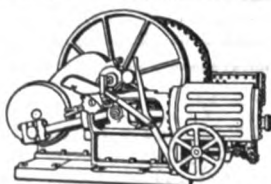
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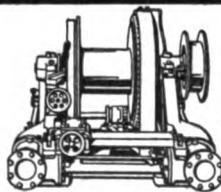
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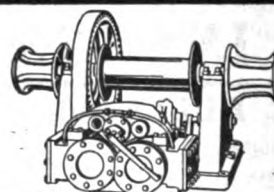
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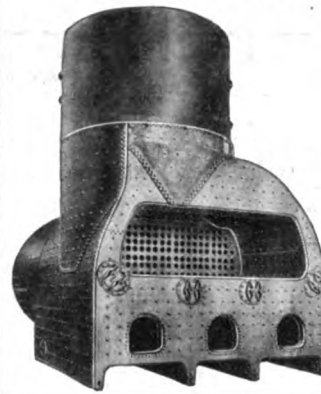
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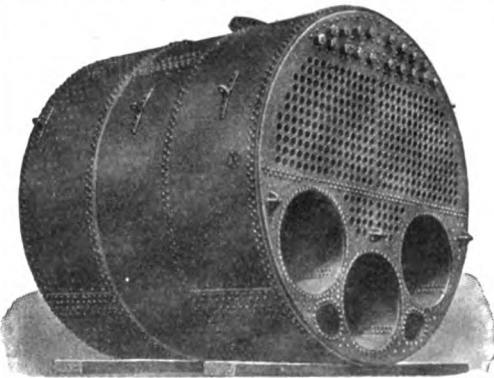
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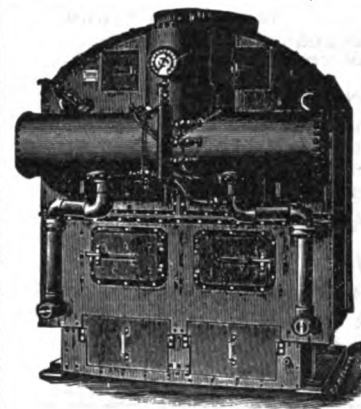
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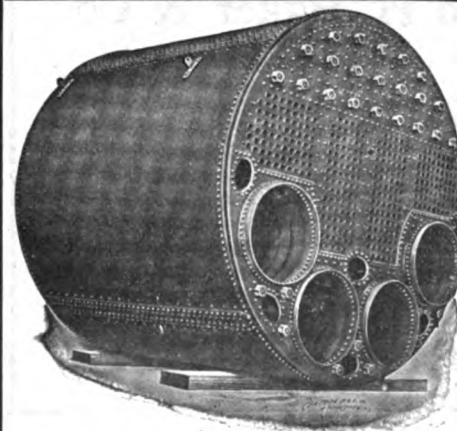
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